# PACIFIC CREST ENVIRONMENTAL

1531 BENDIGO BOULEVARD NORTH PO BOX 952 NORTH BEND, WA 98045 T 425.888.4990 F 425.888.4994

# SOURCE CONTROL EVALUATION REPORT

CHRISTENSON OIL COMPANY 3821 N.W. ST. HELENS ROAD PORTLAND, OREGON 97210

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Submitted by:

Pacific Crest Environmental, LLC 1531 Bendigo Boulevard North North Bend, WA 98045

For:

Oregon Department of Environmental Quality
Northwest Region
2020 SW Fourth Avenue
Portland, Oregon 97201-4987

Pacific Crest No.: 123-001

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Prepared by:

April Wiebenga Project Geologist

Reviewed by:

Lauren Carroll, RG Principal Hydrogeologist

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#### 1.0 INTRODUCTION

### 1.1 PURPOSE

This Source Control Evaluation (SCE) Report has been prepared by Pacific Crest Environmental, LLC (Pacific Crest) on behalf of the Christenson Oil Company (Christenson Oil) to present the results of a stormwater SCE at the Christenson Oil Facility (Facility) located at 3821 N.W. St. Helens Road in Portland, Oregon (the Site). A Site Location Map and Detailed Site Plan are provided as Figure 1 and Figure 2, respectively.

This SCE was conducted in response to the Oregon Department of Environmental Quality (DEQ) correspondence dated January 22, 2010 requesting that Christenson Oil perform a stormwater SCE to identify, evaluate, and control sources of contamination that have the potential to impact the Willamette River in a manner consistent with the DEQ's *Guidance for Evaluating the Stormwater Pathway at Upland Sites* (DEQ, 2009).

#### 1.2 SOURCE CONTROL OBJECTIVE

The objective of this stormwater SCE Report is to demonstrate that existing and potential sources of contamination at the Site have been addressed and that no additional characterization or source control measures are needed at the Site.

### 1.3 REGULATORY FRAMEWORK

The DEQ has designated the Facility as an Upland Site in the Remedial Investigation/Feasibility Study (RI/FS) for the Portland Harbor Superfund Site. The DEQ and US Environmental Protection Agency (EPA) have developed the Portland Harbor Joint Source Control Strategy (JSCS) to identify, evaluate, and control sources of contamination that may reach the Willamette River. As such, it is necessary for Upland Sites in Portland Harbor to evaluate the stormwater pathway to identify upland sources of contamination that adversely impact, or have the potential to adversely impact, the Willamette River, and to implement appropriate source control measures (SCMs) to the extent practical prior to sediment cleanup in the Portland Harbor Superfund Site.

In addition to its designation as an Upland Site for the Portland Harbor Superfund Site RI/FS, recent and historical environmental investigation and monitoring activities have been conducted to assess conditions associated with historical releases of petroleum hydrocarbons at the Site. Groundwater monitoring and remedial activities have and continue to be conducted under the guidance of the DEQ Voluntary Cleanup Program (VCP).

Stormwater data collected for the Facility's National Pollutant Discharge Elimination System (NPDES) Stormwater Discharge General Permit 1200-Z (NPDES General Permit) was integrated, to the extent applicable, with the stormwater SCE. Stormwater samples collected for the NPDES General Permit prior to the implementation of SCMs at the Site provide evidence of SCM effectiveness and are, therefore, provided as Table 1.

#### 1.4 REPORT ORGANIZATION

The Report will be organized as follows:

- **Section 1.0 Introduction –** Presents an introduction, a statement of objectives, project organization and responsibilities, and report organization.
- **Section 2.0 Site Description and History –** Presents a Site description, a summary of current and historical Site activities, and a description of the Site's stormwater conveyance system.
- **Section 3.0 Potential Sources and Contaminants of Interest –** Provides information regarding potential contaminant sources, outfall sediment data, and contaminants of interest (COIs).
- **Section 4.0 Ongoing Stormwater Management Measures –** Presents a summary of ongoing stormwater Best Management Practices (BMPs) conducted at the Site, and information on the mechanisms in place to document the ongoing activities.
- **Section 5.0 Data Collection and Interpretation –** Presents Site specific sampling procedures, a summary of data collected, and interpretation of those data.
- **Section 6.0 Source Control Measures –** Presents a detailed description of any source control evaluation measures used at the Site during the course of this evaluation.
- **Section 7.0 Source Control Evaluation –** Presents evidence to support the determination that stormwater source control has been accomplished, and no additional source control measures are required at the Site.
- **Section 8.0 Findings and Conclusions –** Presents findings and conclusions regarding the Site specific SCE.
- **Section 9.0 References –** Presents a bibliography identifying reports and documents referenced in this Report.

### 2.0 SITE BACKGROUND

### 2.1 SITE DESCRIPTION

The Site is located within Section 19, Township 1 North, Range 1 East of the Willamette Meridian, in the City of Portland, Multnomah County, Oregon (Figure 1), and is situated between the wooded Tualatin Mountains to the west, and the Willamette River to the northeast. The surface elevation of the Site is between approximately 40 to 80 feet above mean sea level (amsl), with an overall surface topographic slope towards the Willamette River located approximately 0.5-mile to the northeast. The southwestern third of the Site slopes steeply toward the northeast, followed by a slope break to a gentle northeasterly slope over the remainder of the Site. The Site surface cover is a mixture of impervious asphalt, concrete, and structures on the northeast portion of the Site, and pervious soil on the southwest portion. Utilities at the Site include City of Portland (COP) storm sewer, water, sanitary sewer, and Northwest Natural Gas line as illustrated in Figure 2.

Shallow groundwater underlying the Site is encountered at approximately 4 to 6 feet below ground surface (bgs) in the eastern portion of the Site and greater than 20 feet bgs in the western portion of the Site. The overall direction of shallow groundwater flow beneath the Site is to the northeast, with minor localized variations attributed to surface topography, and variable permeabilities between surface cover and shallow subgrade materials. A map with the potentiometric surface of the Site is provided as Figure 3.

The Site is developed with two structures, including an approximately 19,000 square-foot, single-level building (Main Building) and an approximately 2,000 square-foot storage building (Storage Building). According to the COP, the Main Building was constructed in 1947. The Main Building is a prefabricated Quonset-style metal building made of galvanized steel. The Main Building includes an office and warehouse space, an assembly line for packaging product, and three indoor aboveground storage tank (ASTs) areas (Tank Farms C, D and E) for storing and blending petroleum-based lubricants. There are currently thirty-three indoor ASTs with an aggregate storage capacity of approximately 122,700 gallons. Paved loading and receiving docks are located at the front of the Main Building and slope towards a catch basin located in the receiving area (CB-1). Behind the Main Building, additional ASTs are segregating into two areas (Tank Farms A and B), each of which are fully enclosed by secondary containment. Tank Farms A and B include thirteen additional ASTs with a total storage capacity of approximately 183,900 gallons. Site features are presented on Figure 2.

The Site is located within an area of northwest Portland zoned as "heavy industrial". The Site is bordered to the west by Forest Park; to the south-southeast by Baxter-Flaming Industries, which has reportedly operated as a varnish factory, a putty factory, and wrecking facility; to the east-northeast by NW St. Helens Road and beyond by a bulk terminal owned by Shell Oil Products Company (DEQ ECSI No.169); and to the north-northwest by an approximately 3-acre property leased by Christenson Oil from HAJ Properties, LLC for administrative and warehousing functions other than manufacturing.

#### 2.2 STORMWATER CONVEYANCE SYSTEM

The Site consists of a single stormwater basin (Basin A) conveying stormwater either into the COP stormwater system in areas with impervious surfaces (e.g. metal roof and pavement) or

into the subsurface in areas with pervious surfaces. The overland flow of stormwater at the Site is generally from the southwest to northeast, in the general direction of the topographic slope (Figure 4). The stormwater flow collected from impervious areas of Basin A is collected in catch basin CB-1, located in the paved parking area southeast of the Main Building. Stormwater is conveyed from catch basin CB-1 through underground piping into a 6,300-gallon capacity oil water separator (OWS) and, after passing through the OWS, travels through underground piping into the COP shared stormwater conveyance system located in the right-of-way of NW St. Helens Road. Heritage Surveying of Portland, Oregon (Heritage) conducted a survey of the components of the Site stormwater system and other relevant features relative to a COP benchmark (BM 3319). The survey indicated that the invert elevation of the shallow flow components of the stormwater system conduits (i.e., catch basin, culverts, inflow and outflow to the oil/water separator) are located at a relatively higher elevation, and do not intersect the groundwater table. A copy of the map generated by Heritage is provided in Appendix A.

The COP stormwater conveyance system extends east beneath the Shell Bulk Terminal and stormwater collected in this system ultimately discharges into the Willamette River at Outfall #18, near River Mile 8.8.

The exceptions to the general stormwater flow at the Site are summarized as follows:

- Precipitation and stormwater runoff in the western unpaved portion of the Site, west of the Main Building, is expected to infiltrate directly into the subsurface.
- Overland flow of stormwater from Forest Park is diverted into Green Creek, an intermittent stream, located parallel to the north-northwest property boundary. Prior to the mid-1980s, Green Creek flowed beneath the Facility. In the mid-1980s, the COP rerouted Green Creek to its present location parallel to the north-northwest Site boundary (Figure 2). Green Creek flows through a 36-inch diameter culvert from the northwest Site property corner and daylights approximately 120 feet west of NW St. Helens Road. Flow from Green Creek enters the stormwater system through a 12-inch pipe located approximately 10 feet west of NW St. Helens Road (Figure 2).
- Stormwater flow from NW St. Helens Road is captured in catch basins CB-2 and CB-3, located in the right-of-way of NW St. Helens Road (Figure 4). Catch basin CB-3 is located in the NW St. Helens Road right-of-way, adjacent to the northern corner of the Site near the confluence of Green Creek with the COP conveyance system. Catch basin CB-2, located in the NW St. Helens Road right-of-way, is adjacent to the eastern corner of the Site. Stormwater flow received from catch basins CB-1, CB-2, and CB-3 converge in the COP stormwater conveyance system which extends east beneath the Shell/Equilon Bulk Terminal and ultimately discharges at Outfall #18 near River Mile 8.8.

## 2.2.1 Stormwater Conveyance System Survey

On February 4, 2013, a stormwater conveyance system survey was conducted by River City Environmental, Inc. of Portland, Oregon (River City) using an inline video camera to observe the condition of storm sewer conduits and subsurface components servicing the Site. River City was subcontracted and directed by Wohlers Environmental Services, Inc. (Wohlers) of Tigard, Oregon. As determined by the diameter of the sewer pipe, either a maneuverable, remote-controlled video camera or a push camera equipped with fiber rods was used during the survey to record the location of the camera in the system and the corresponding condition of the storm

sewer. Wohlers field personnel attempted to survey the following sections of the stormwater system:

- The stormwater system located between CB-1/OWS in the loading area of the Site and the shared COP conveyance system in the adjacent right-of-way; and
- The stormwater system located between the Green Creek inlet and the confluence with the conveyance piping from CB-1/OWS.

The actual stormwater conveyance system survey videos are provided as Appendix B. Notable observations are listed below.

- Access to the sewer connecting the OWS to the catch basin was gained via a stormwater service vault in the NW St. Helens Road right-of-way. This section of sewer extends approximately 14 feet northwest of the service vault before turning sharply to the southwest toward the OWS. It appears that a "T" joint was used by the City of Portland during construction of the sewer rather than a 90 degree "elbow" joint; therefore, the northwestern opening of the "T" joint was intentionally blocked using cobbles, small boulders and cement to seal the unnecessary opening.
- Wohlers field personnel were unable to survey the northwest to southeast trending sewer section connecting City Manhole AAT511 to Manhole AAT510 located in the NW St. Helens Road right-of-way due to camera inaccessibility. Survey contractors reported that approximately fifty percent of the 12" concrete pipe was congested with gravel and cobbles, despite repeated attempts to clear the line using a Vactor® truck jetter.

An illustration of the sections of sewer that were successfully surveyed is provided as Figure 5. With the exception of the issues discussed above, no other notable observations were made during the stormwater conveyance system survey.

#### 2.3 SITE OWNERSHIP AND OPERATING HISTORY

The Site has been operated by Christenson Oil and predecessor businesses since the late 1940s. Christenson Oil has conducted mixing, blending, packaging, and storage of various petroleum-based lubrication products in five tank farms located on Site (Figure 2), and in former underground storage tanks (USTs) which contained diesel, kerosene, and Stoddard Solvent. The former USTs were decommissioned between 1989 and 1993.

There have been several documented releases of petroleum products from ASTs and USTs on the property since 1975. The products reportedly released at the Site have included: base oil (Bright Stock), diesel fuel, kerosene, Stoddard Solvent (a type of mineral spirits), hydraulic oil, and chain oil. Following each release, mitigation measures were conducted to control the release; recover the lost product; and to clean up impacted media. Additional information regarding historical releases at the Site is provided in the *Expanded Preliminary Assessment Report* (XPA) prepared by Wohlers, dated December 4, 2006 (Wohlers, 2006A).

#### 2.4 REGULATORY HISTORY

This section presents an overview of the regulatory history of the Site in relation to stormwater discharge, regulated tanks, and hazardous waste generation.

#### 2.4.1 Stormwater Permit

Stormwater discharge from the Site is permitted under Christenson Oil's NPDES General Permit. The NPDES General Permit was initially obtained in 1998, with subsequent renewals as necessary. The NPDES General Permit specifies the requirements, limitations, and operating conditions for the management of stormwater at the Site, including implementation of an approved *Stormwater Pollution Control Plan* (SWPCP); regular stormwater and sediment monitoring; inspections and reporting; and guidance for SCMs. Prior to April 2008, the stormwater monitoring requirements under the permit consisted of the collection of a minimum of four grab stormwater samples per year and analysis of Total Suspended Solids (TSS), Oil & Grease (O&G), pH, copper, lead, and zinc, with monthly inspections consisting of visual assessments of floating solids and O&G sheen at representative discharge locations.

In April 2008, on the basis of an exemplary compliance record, Christenson Oil obtained a "Monitoring Waiver" (Waiver) from the COP Bureau of Environmental Services (BES) for all analytes except for pH. Christianson Oil subsequently obtained a Waiver for the analysis of pH in November 2008. The Waiver applied to the collection of stormwater samples at the outlet of the OWS. While the Waiver was in effect, the stormwater monitoring requirements consisted of monthly visual monitoring for the presence of O&G sheen and floating solids.

Stormwater discharge sampling resumed upon the DEQ issuance of a revised NPDES General 1200-Z Industrial Discharge Permit on July 1, 2012. The revised permit contains requirements for the analysis of additional analytes, as well as the frequency and timing of sample collection. A summary of the stormwater discharge sampling data conducted at the Site is provided in Table 1.

#### 2.4.2 Regulated Tanks

There are currently forty-six ASTs located on the Site, many of which were installed in the 1990s. Specific details regarding each of the Tank Farms are provided below.

- Tank Farm A currently consists of ten exterior ASTs, the majority of which are believed to have been in place since the mid-1940s. The secondary containment berm surrounding the tanks was also constructed in the mid-1940s.
- Tank Farm B, consisting of three exterior ASTs, was installed in 1990 with the surrounding concrete containment area.
- Tank Farm C, consisting of thirteen interior ASTs, was installed in 1995 with the surrounding concrete containment area.
- Tank Farm D, consisting of ten interior ASTs, was installed in 1996 with the surrounding concrete containment berm.
- Certain interior ASTs housed in Tank Farm E are believed to have been in place since the mid to late 1940s. The remaining ASTs in Tank Farm E were installed in the mid to late 1970s.

 Three USTs which formerly operated at the Site for the storage of diesel, kerosene, and Stoddard Solvent were decommissioned between 1989 and 1993. No regulated USTs are currently located at the Site.

The ASTs range in capacity from 500-gallons to 30,000-gallons and have a combined oil storage capacity of approximately 306,600 gallons. The ASTs at the Facility are registered with the Oregon State Fire Marshal's office and the COP Fire Department.

Spill prevention measures for the ASTs are regulated by the EPA under 40 Code of Federal Regulations (CFR) Part 112 – Oil Pollution Prevention. In accordance with 40 CFR 112, Christenson Oil has prepared a Spill Prevention Control and Countermeasure (SPCC) Plan for the Facility (Wohlers 2003), and implements the spill prevention measures for the Site in accordance with the SPCC Plan. The particular handling practices for avoiding spills of raw materials and blended products at the Site are described in detail in the SPCC Plan. These measures include: preventing minor spills and/or drips from entering stormwater runoff during the transferring of product to and from ASTs, protection of exterior ASTs within secondary containment structures and within buildings (e.g., Tank Farms C and D). Additionally, Christenson Oil has implemented bulk unloading procedures to avoid spills and prevent pollution. Spill prevention control and countermeasures have been updated as needed over the years of operation.

### 2.4.3 Hazardous Waste Management

Christenson Oil operations at the Site do not include activities that generate hazardous waste requiring management under state or federal regulations.

#### 2.5 PREVIOUS INVESTIGATIONS

This section presents a summary of the Site's status within the Portland Harbor Superfund Site and summarizes the cleanup action and environmental investigation activities that Christenson Oil has conducted at the Site.

#### 2.5.1 Portland Harbor Superfund Site

On December 1, 2000, the EPA placed a heavily industrialized stretch of the Willamette River (Portland Harbor) on the Superfund National Priorities List (NPL). The EPA sent "Notice of Potential Liability" letters to potentially responsible parties (PRPs) associated with the Portland Harbor Superfund Site, including Christenson Oil. The EPA determined that sediments in the portion of the Willamette River designated as a Superfund Site, as well as soil and groundwater at sites located upland of the river (Upland Sites) within the boundaries of the Portland Harbor, are contaminated with various contaminants of concern (COCs), including metals, polycyclic aromatic hydrocarbons (PAHs), phthalates, polychlorinated biphenyls (PCBs), chlorinated pesticides, total petroleum hydrocarbons (TPH), and dioxins. The DEQ has been authorized to evaluate Upland Sites for potential sources of COCs that may have contributed to contaminated sediment in the Portland Harbor Superfund Site. Within the framework of the Portland Harbor Superfund Site, the Christenson Oil Site is an Upland Site located approximately at River Mile (RM) 8.8 on the west bank of the Willamette River. A chronologic summary of relevant investigation activities is presented below:

- In October 1999, the Site was added to the DEQ Environmental Cleanup Site Information (ECSI) List (ECSI #2426) on the basis of: a history of upland releases at the Site; the location of the Site within the Portland Harbor geographic boundaries; and the stormwater discharge pathway from the Site to Outfall #18 on the Willamette River.
- On July 14, 2000, DEQ requested that Christenson Oil conduct a Preliminary Assessment to assess whether hazardous substances have potentially been released at the Facility and if the releases had the potential to impact the Willamette River sediments.
- The *Pre-Assessment Screen for the Portland Harbor Superfund Site* prepared by the Portland Harbor Natural Resource Trustee Council dated January 2007 identified the COCs for the Christenson Oil Site to include TPH, PAHs, benzene, toluene, ethylbenzene and xylenes (BTEX), copper, lead, and zinc.

### 2.5.2 Site Investigation and Cleanup

Christenson Oil has conducted cleanup action activities to address releases at the Site and investigation activities to assess the nature and extent of affected soil and groundwater, and to characterize the geologic and hydrogeologic conditions at the Site. The cleanup action activities have included: containment and recovery of released materials; excavation of affected soil; light non-aqueous phase liquid (LNAPL) recovery; and petroleum contaminated groundwater recovery, treatment, and disposal. The investigation activities have included: advancing soil borings; installing groundwater monitoring wells; collecting soil, groundwater, stormwater, and catch basin sediment samples for laboratory analysis; and assessing the results in accordance with industry practice. The tank farms and impervious surfaces are illustrated on Figure 2. A chronologic summary of the cleanup and investigation activities is provided below:

- In October 1975, approximately 1,000 gallons of Bright Stock was released from a transfer valve that was inadvertently left open inside the Main Building. The Bright Stock was collected by the floor drain and reportedly contained upon reaching the intermittent stream. The material was subsequently cleaned up and did not travel off Site (Wohlers 2000).
- In April 1989, Christenson Oil decommissioned and removed one 10,000-gallon capacity UST that previously contained diesel fuel from the Site.
- In October 1990, Petroleum Services Unlimited, Inc. (Petroleum Services) excavated two 10,000-gallon capacity USTs that previously contained kerosene and Stoddard Solvent from their locations southwest of the Storage Building. The USTs were relocated to Tank Farm B and repurposed as ASTs. Laboratory analysis of soil samples collected during the UST decommissioning activities detected concentrations of TPH in the Stoddard Solvent (mineral oil), diesel fuel, and heavy oil ranges. Petroleum Services attributed the detected concentrations of TPH in soil to minor spills associated with operation of the former USTs. Between 1991 and 1993, approximately 116 cubic yards of petroleum affected soil that had been over-excavated during the UST decommissioning was treated on-Site by rototill-assisted aeration. Upon confirmation of successful remediation, the soil was placed as fill in the western portion of the Site. DEQ provided notification to Christenson Oil that cleanup requirements were met in a No Further Action Letter for Leaking USTs dated November 14, 2000.

- In November 1995, approximately 60 gallons of hydraulic oil were released from a dislodged transfer hose to a receiving truck in the loading bay area adjacent to the dispensing area. The release was reported to the COP BES and DEQ through the Oregon Emergency Response System (OERS) (DEQ Spill Number 95-263; OERS Number 95-2221). The spill was contained on three sides by asphalt containment berms. Spill response measures consisted of: immediately applying a drain block over the nearest downstream catch basin, applying absorbent materials to the spill, and collecting residual liquid with a vacuum truck. The spill response measure prevented the release from leaving the Site and resulted in a *de minimis* determination by DEQ (Wohlers 2000, Wohlers 2006A).
- In September 1998, approximately 715 gallons of bar (chain) oil, or line flush oil, was released as a result of overfilling an AST located in Tank Farm A. The release was reported to OERS (OERS Number 98-2288) and contained within the Tank Farm A secondary containment area. The spill response measures consisted of using a suction pump, absorbent booms, and absorbent pads to recover residual liquids. The used absorbent booms and pads were transported to a waste disposal company for recovery and recycling (Wohlers, 2006A).
- In October 2000, Wohlers submitted a Voluntary Preliminary Assessment Report (PA) to DEQ describing the Site background, products and materials used at the Site, and potential contaminant exposure pathways. The PA concluded that historical releases at the Site, Site operations, and existing conditions were not likely to pose a significant impact to human or ecological health associated with groundwater, surface water, air, direct contact, and stormwater discharge at the Site (Wohlers, 2000).
- In August 2001, Wohlers advanced five soil borings at locations within the Tank Farm A containment area, collected shallow soil samples, and submitted the samples for laboratory analysis to assess the residual concentrations of petroleum hydrocarbons related to the September 1998 bar oil release. The laboratory analytical results indicated the highest concentrations of TPH detected in soil samples were present at the surface, and concentrations of TPH in soil samples decreased with depth. The results of the subsurface soil assessment were documented in a *Transmittal of Soil Sampling Results* prepared by Wohlers, dated September 2001.
- In May 2006, a Christenson Oil subcontractor conducted routine concrete floor repair activities in a portion of the Main Building. During the construction activities, petroleum affected soil was encountered beneath a portion of the concrete slab located in the southern corner of the loading dock/storage area. Wohlers conducted oversight during the subsequent excavation of approximately 75 tons of petroleum impacted soil from this location. The excavated soil was transported off-site for disposal at a permitted landfill. Additionally, approximately 4,000 gallons of impacted water was pumped from the open excavation into a 6,500-gallon capacity AST and treated on-Site by air sparging and aeration. The effective treatment of the recovered groundwater was confirmed by laboratory analysis, and the groundwater was discharged from the 6,500-gallon AST to the COP sanitary sewer system on July 11, 2006 upon receipt of a "Batch Discharge Authorization Letter" (Batch No. 2006-034) from the COP BES (Wohlers, 2006A). The excavation oversight included the collection of confirmation soil samples from the excavation sidewalls and the collection of one water sample from within the excavation area for laboratory analysis. Laboratory analysis of the sidewall samples detected diesel and oil range TPH at concentrations ranging from 113 milligrams per kilogram (mg/kg) to

- 21,200 mg/kg. In June 2006, tightness testing was conducted on the product dispensing line that transferred Stoddard Solvent from an AST in Tank Farm B to the receiving dock. The tightness testing results indicated a gradual leak in the product line between the AST containing Stoddard Solvent and the dispenser located in the loading dock area, which was soon after repaired. The gradual leak in the product line is interpreted as the source of Stoddard Solvent range TPH in soil and groundwater in this localized area of the Site's subsurface. The results of the initial response are documented in the XPA, dated December 2006 (Wohlers, 2006A).
- In August 2006, Wohlers conducted further subsurface investigation to assess the areal extent of contamination associated with the Stoddard Solvent release discovered in May 2006. The additional investigation consisted of: advancing nine soil borings (DP-1, DP-2, DP-3, and MW-1 through MW-6); collecting soil samples from the borings for laboratory analysis; completing six of the nine borings as monitoring wells (MW-1 through MW-6); measuring groundwater elevations in the wells; and, collecting groundwater samples from the wells and reconnaissance groundwater samples from the borings for laboratory analysis. The soil and groundwater samples were analyzed for gasoline, diesel and oil range TPH, volatile organic compounds (VOCs), PAHs and total metals (antimony, arsenic, cadmium, chromium, copper, lead, manganese, mercury, nickel, selenium, silver, and zinc). Laboratory analysis of soil and groundwater samples detected: TPH in the gasoline, diesel, and oil ranges; select VOCs; select PAHs; barium; chromium; and lead. The results of the investigation are documented in the XPA, dated December 2006 (Wohlers, 2006A). The XPA includes recommendations that a stormwater assessment be conducted in accordance with Portland Harbor JSCS, and that a quarterly groundwater monitoring program be implemented at the Site.
- Quarterly groundwater monitoring and sampling events have been conducted at the Site on the following dates: March 28, 2007; June 28, 2007; September 24, 2007; December 27, 2007; March 31, 2008; June 10, 2008; August 6, 2008; December 31, 2008; March 25, 2009; June 23, 2009; September 22, 2009; December 21, 2009; March 26, 2010; June 24, 2010: September 6, 2010: December 8, 2010: March 10, 2011: June 20, 2011: August 31, 2011; December 20, 2011; March 28, 2012; June 27, 2012; September 19, 2012; December 12, 2012; March 19, 2013; and June 26, 2013. monitoring is conducted on a quarterly basis to facilitate the on-going assessment of the nature and distribution of COCs in groundwater at the Site, in accordance with Oregon regulations and DEQ guidance. LNAPL has been measured in well MW-2 since 2007. The results of groundwater monitoring activities indicate petroleum hydrocarbon-related contamination is present in groundwater in the eastern portion of the Site. assessment of the analytical results for groundwater samples indicates a decreasing trend in petroleum hydrocarbon concentrations over time. Concentrations of metals have been detected in groundwater samples collected throughout the Site. Based the distribution and species of metals detected, the concentrations of metals in groundwater do not appear to be the result of anthropogenic causes. The groundwater monitoring and sampling results have been summarized in reports submitted to the DEQ.
- In the third quarter of 2009, LNAPL mitigation activities were initiated at the Site in accordance with the Workplan for Limited Environmental Assessment and Interim LNAPL Mitigation (Pacific Crest, 2009). The LNAPL mitigation activities consisted of the installation of a passive skimmer intended as an interim measure for the recovery of a limited quantity of Stoddard Solvent present as LNAPL in the vicinity of MW-2. Additionally, on June 29, 2010, a dual phase vacuum extraction (DPVE) event was

conducted to recover LNAPL and soil vapor containing concentrations of TPH from the vicinity of well MW-2, in accordance with the *DPVE Work Plan* prepared by Pacific Crest, dated March 22, 2010. Well MW-2 is located hydraulically down-gradient, approximately 40 feet east of the inferred source area for the Stoddard Solvent release that discovered in May 2006 (Wohlers, 2006A). Documentation of LNAPL mitigation activities is provided in quarterly progress reports prepared by Pacific Crest.

### 2.5.3 Stormwater Pathway Evaluation

Under the guidance of DEQ and in accordance with the *Framework for Portland Harbor Storm Water Screening Evaluations* of the *Portland Harbor Joint Source Control Strategy* dated December 2005, Christenson Oil is obligated to facilitate the identification of potential sources of COCs at the Site and to evaluate Site-specific COCs for the stormwater pathway to identify upland sources of contamination that adversely impact, or have the potential to adversely impact, the Willamette River. A chronologic summary of sampling and investigation activities that are related to the characterization of the stormwater pathway at the Site is presented below:

- Between 1998 and April 2008, Christenson Oil conducted stormwater monitoring activities that consisted of: collecting of a minimum of four grab stormwater samples per year; analysis of the samples for TSS, O&G, pH, copper, lead, and zinc; and, monthly visual inspections of representative discharge locations for floating solids and O&G sheen in accordance with the NPDES General Permit. The data collected pursuant to the NPDES General Permit established that the BMPs and SCMs implemented by Christenson Oil were effective at maintaining compliance with stormwater discharge permit benchmarks.
- In 2006 and 2007, Wohlers conducted stormwater and storm drain sediment sampling in accordance with the *Project Workplan Storm Drain Sediment & Stormwater Sampling*, dated October 2, 2006 (Wohlers, 2006B) as a requirement of the NPDES General Permit. The sampling included the collection of a storm drain sediment samples from catch basin CB-1 in October 2006; and the collection of stormwater samples from the OWS in December 2006, March 2007, and April 2007. The samples were analyzed for TPH, VOCs, semivolatile organic compounds (SVOCs), PCBs, pesticides and total metals.
- In 2008, on the basis of the historical monitoring results, Christenson Oil requested and obtained from DEQ a waiver limiting the stormwater monitoring activities conducted under the NPDES General Permit to monthly visual inspection of O&G sheen and floating solids. The monthly visual monitoring has not reported any observed sheen, odor, or floating solids in catch basin CB-1 over the reporting period.
- In April 2010, Wohlers collected surface water samples from two locations in the intermittent Green Creek, in accordance with the *Workplan for Limited Environmental Assessment and Interim LNAPL Mitigation* (Pacific Crest, 2009). The purpose of the surface water sampling was to evaluate the quality of the surface water as it entered the Site from the up-gradient portion of the Site, and as it entered the influent to the stormwater conveyance system in the down-gradient portion of the Site. The surface water samples were analyzed for TPH, VOCs, SVOCs, PCBs and total metals.

The stormwater drainage both on and adjacent to the Site is illustrated on Figure 4 – Site Drainage Map.

### 3.0 POTENTIAL SOURCES AND CONTAMINANTS OF INTEREST

The following sections discuss potential sources and COIs at the Site.

#### 3.1 POTENTIAL CONTAMINANT SOURCES

### 3.1.1 Building Materials

The Main Building is a prefabricated Quonset-style metal building that is constructed of galvanized steel. The galvanized steel material is a potential source of lead (Pb), zinc (Zn), copper (Cu) and iron (Fe) in rainwater that comes into contact with the metal.

### 3.1.2 Airborne Deposition and Pollen

The Site is located adjacent to a densely wooded section of the Tualatin Mountains. Studies (Perugini et al, 2011) (Botré and Conti, 2001) have documented the propensity of pollen to absorb and bioaccumulate heavy metals, particularly in urban or industrial locations.

### 3.1.3 Materials and Operations

As discussed previously, materials used in the Facility operations include raw materials and blended products. These include: motor oils, transmission oils, gear oils, hydraulic fluids, bar and chain oils, Stoddard Solvent, kerosene, diesel, and various packaged lubricants. A complete inventory of the volume, storage method, and period of use for each storage tank is provided as Appendix C. If released, these materials represent potential contaminants.

Site operations consist of: selling lubricants and related products manufactured by others and formulation, blending and packaging of specialty lubricants. Products for resale are received either as bulk lubricants or fully pre-packaged products manufactured by other companies, which Christenson Oil offers for sale on a wholesale basis. Pre-packaged products are delivered to the Christenson Oil warehouse located at 3865 NW St. Helens Road and are picked up or delivered to customers upon purchase. Bulk lubricants manufactured by other companies are delivered to 3821 NW St. Helens Road for storage and subsequent sale. Packaging occurs within the Main Building on an assembly line adjacent to Tank Farms C, D and E. Blended products are containerized in tote bins and drums ranging in volume from approximately 16 gallons to 300 gallons in capacity. Containers are filled directly from either a bulk storage AST or a blending AST. Product is metered into the container based on a weight specification. Flow is interrupted automatically as the weight specification is reached.

Packaging of kerosene and Stoddard Solvent into one-gallon and two-gallon containers occurs outside the Main Building. Bulk unloading of kerosene and Stoddard Solvent occurs by gravity feed through piping to a bulk truck located at the receiving dock. Forklifts are used to transport packaged products from trucks.

Raw materials are transported to the Site (3821 NW St. Helens Road) via bulk trucks. A line is then connected from the truck to the appropriate storage tank. Bulk loading and unloading of lubricant product occurs at both the receiving dock and the lubricant dispensing area. Operations at the Site do not include the use, treatment or disposal of any product.

Product at the Site is stored in ASTs located in five tank farms equipped with engineered measures to contain spills and releases. Tank Farms A and B are located outdoors in bermed

enclosures which provide secondary containment for potential releases. Tank Farms C and D are located inside the Main Building in bermed enclosures which provide secondary containment for potential releases. The ASTs in Tank Farm E are situated on a concrete slab within the Main Building and the ASTs are equipped with a high level switch and alarm which is connected to a solenoid control valve. The valve is designed to close automatically when tanks are filled above a certain level or upon power loss to the building. Additionally, the blending ASTs in Tank Farm E are typically emptied at the close of each business day. The desired outcome of this SCM is to eliminate the potential for a release or spill to reach an on-Site catch basin or travel outside of the property boundaries in the event of an emergency.

An overview of the secondary containment implementation timeline is provided below:

- The containment area surrounding Tank Farm A was constructed in the mid-1940s.
- The containment area surrounding Tank Farm B was constructed in 1990;
- The containment area surrounding Tank Farm C was constructed in 1995;
- The containment area surrounding Tank Farm D was constructed in 1996;

Proper capacity design and frequent inspection of the secondary containment areas ensures the SCM effectiveness in the event that a significant spill or release should occur at the Site.

Equipment at the Site includes nine company vehicles used for delivery of product to customers, as well as two forklifts. Worn tire tread from forklift and truck tires contain as much as 1% zinc and represent a potential source of contamination.

#### 3.1.4 Historical Releases

Previously discussed historical releases of petroleum hydrocarbons to the surface occurred and were subsequently contained and cleaned up. None of the releases reached the Willamette River. Subsurface releases resulting in impacts to groundwater have occurred at the Site, and if a complete pathway existed between groundwater and the stormwater conveyance system, contaminants could potentially be discharged to the Willamette River. However, as described in Section 2.2, an elevation survey of the current stormwater conveyance system components at the Site indicates that the invert elevations of the shallow flow components of the stormwater system conduits (i.e., catch basin, culverts, inflow and outflow to the OWS) are higher than (and therefore do not intersect) the groundwater table. Because the stormwater system conduits and the groundwater table do not intersect, impacted groundwater cannot enter into the stormwater conveyance system on the Site and there is no complete pathway for groundwater migration to the river. A copy of the map generated by Heritage is provided in Appendix A.

### 3.2 OUTFALL SEDIMENT DATA

Based on contaminant concentrations in Willamette River sediment samples, Outfall #18 is within a river reach identified by the EPA as an area of potential concern for PCBs, copper, lead, zinc, tributyltin, dichlorodiphenyltrichloroethane (DDT), PAHs and phthalates, and by the Lower Willamette Group (LWG) for PCBs, aldrin, and DDT (COP BES, 2010). In 1997, the EPA conducted an evaluation of sediment contamination within a six mile stretch of the Willamette River, which included the collection of seven sediment samples in the vicinity of Outfall #18 (DEQ, 2000). A summary of the sediment data collected for Outfall #18 is provided as Table 2.

The data are inclusive of sampling upstream, downstream, and adjacent to the outfall. A figure depicting sample locations is provided as Appendix D.

#### 3.3 CONTAMINANTS OF INTEREST

The following COIs are of primary concern with relation to the Site:

- TPH as gasoline range organics (GRO), diesel range organics (DRO) and oil range organics (ORO);
- PAHs and phthalates;
- Total metals (arsenic, barium, cadmium, chromium, copper, lead, manganese, mercury, nickel, selenium, silver and zinc);
- PCB Aroclors;
- Total organic carbon (TOC); and
- TSS.

The COIs for the Site were selected based upon the following criteria: previously identified COCs for the Site; historical and current Site operations; past environmental investigations; materials stored/handled at the Facility; compliance history with regulatory permits; and the contaminants identified in proximity to Outfall #18 in the Willamette River.

### 4.0 ONGOING STORMWATER MANAGEMENT MEASURES

This section presents a summary of the BMPs being implemented at the Site and mechanisms in place to document these practices and ensure their ongoing implementation and effectiveness. The preventative measures are presented in accordance with the general mitigation categories identified by the DEQ.

#### 4.1 EMPLOYEE EDUCATION AND TRAINING

- Employee spill prevention education and training includes periodic review of the SWPCP Employee Awareness Program to raise employee understanding and awareness of spill prevention and reporting procedures and good housekeeping practices. In addition, the Facility conducts annual employee awareness training as required by the SPCC Plan.
- In the lube dispensing area, drivers are instructed to chock tires, and confirm air
  pressure release to reduce possible movement at hoses or fittings, and to lay down
  absorbent materials and drip pans beneath hose connection points. At the completion of
  operations, drivers are instructed to blow out the hose line to remove free liquid,
  disconnect the fittings and allow minor quantities of liquid in the hose to drain to the
  underlying container, and to plug the hoses.
- Drivers loading or unloading product at the receiving dock are instructed to chock their tires prior to initiating loading/unloading.
- Spill response procedures and emergency instructions are posted at several strategic locations throughout the Facility.
- A notebook containing copies of the SWPCP, SPCC, maintenance reports, regular inspection checklists, records of any leaks/spills and related corrective actions, is maintained at the Site and is available for review by Facility personnel and authorized regulatory representatives.

### 4.2 DEBRIS REMOVAL

- The two stage filters installed in catch basin CB-1, and the OWS are cleaned and/or maintained on a semi-annual schedule, generally in the spring and fall.
- Paved areas are swept on a quarterly schedule to reduce the quantity of sediment and debris entering the stormwater conveyance system.
- Facility-wide inspections are conducted on a monthly basis, including the critical points
  of the stormwater drainage system, product storage areas (tank farms), container
  storage area, parking areas, and maintenance equipment and spill response storage
  areas.

### 4.3 EXPOSURE REDUCTION

 Product at the Site is stored in ASTs located in five tank farms equipped with engineered measures to contain spills and releases. Tank Farms A and B are located outdoors in bermed enclosures providing secondary containment for potential releases. Tank Farms C and D are located inside the Main Building also in bermed enclosures providing secondary containment for potential releases. The ASTs in Tank Farm E are situated on a concrete slab within the Main Building. The ASTs in Tank Farm E are equipped with a high level switch and alarm connected to a solenoid control valve designed to close automatically when the tanks are filled above a specified level, or upon power loss to the building. The blending ASTs in Tank Farm E are typically emptied at the close of each business day.

- Drums and other product containers are stored in covered areas of the Site, protected from precipitation, and out of the direct pathway of stormwater.
- Spill cleanup equipment (pads, booms, snakes, clay, drain mats, etc.) is maintained in easily accessible locations proximate to work areas where minor leaks or spills may occur to facilitate immediate containment and cleanup.
- At loading connection points, drip containers are utilized to catch minor spills.
- Vehicle washing is not permitted at the Site.

### 4.4 RUNOFF DIVERSION

Stormwater runoff diversion structures (e.g. gutters, drains, dikes, and graded pavement) collect and divert runoff to minimize the potential for contamination of stormwater and receiving waters. Stormwater runoff from the operations area of the Facility is directed by gutters and graded pavement toward catch basin CB-1. Catch basin CB-1 is equipped with a two-stage filter insert and is the only catch basin that receives stormwater from impervious surfaces on the Site. Filtered stormwater from catch basin CB-1 flows to an underground OWS prior to discharging to the COP shared conveyance system.

### 5.0 DATA COLLECTION AND INTERPRETATION

Data was collected for the SCE in general accordance with the DEQ approved *Draft Source Control Evaluation Work Plan* (SCE Work Plan) dated April 13, 2011 (Pacific Crest, 2011). The following sampling was conducted as part of the SCE:

- Catch basin sediment sampling on December 1, 2010;
- Stormwater sampling on November 16, 2011, January 29, 2012, March 5, 2012, and May 21, 2012; and
- OWS sediment sampling on September 20, 2012.

The quality of the sampling activities and results was assessed in accordance with the SCE Quality Assurance Project Plan (SCE QAPP) that was developed in accordance with the *Guidance on Quality Assurance Project Plans* (EPA, 2002) and is provided as Appendix E of the SCE Work Plan. The quality assurance activities consisted of data review, verification, and validation. The purpose of the verification and validation procedures was to assess whether the data conform to established project requirements and to determine if limitations exist if data do not conform to the project requirements, data quality objectives, and/or method-specific requirements.

Verification of sampling information and chemical data occurred at several levels throughout the course of sample collection and analysis. Data verification is the process of determining whether data have been collected or generated according to a sampling and analysis plan and the respective SOPs or method descriptions. Data verification consisted of the following categories: verification of compliance with the SOP and SCE Work Plan; verification of correctness to determine that the data collection plans and protocols were followed; and verification of completeness of the data sets and supporting documentation to confirm that all data necessary to meet the sampling objectives have been collected.

Analytical data were validated after the field activities were completed, the results reported by the laboratory were available, and all data were verified. Data validation requirements were completed prior to use of the data for interpretive activities. Data validation is the process of evaluating the technical usability of the verified data with respect to the planned objectives of the project. Data validation consisted of the following objectives: verifying that field and laboratory measurements were appropriate for sampling objectives; providing information to the data user regarding data quality by assignment of individual data qualifiers based on the associated degree of variability; and determining whether data quality objectives were met.

Data validation procedures included evaluating the sample results and applicable quality control measurement results reported by the laboratories. Analytical data were validated in accordance with guidance specified by the EPA in the context of method-specific and laboratory-established quality control requirements, as applicable.

All SCE data has been subjected to two levels of a quality assurance/quality control (QA/QC) evaluation: one by the laboratory for all analytical data, and one by Pacific Crest for both analytical and field data. The laboratory performed the initial data reduction, evaluation, and reporting in accordance with the Friedman & Bruya *Quality Assurance Manual*, provided as Appendix A of the SCE QAPP. The analytical data was then validated by Pacific Crest.

#### 5.1 SAMPLING

The following sections present the methodologies employed during the collection and analysis of representative sediment and stormwater samples collected from the catch basin and OWS servicing the Site.

Historical sampling of catch basin sediment, stormwater, and surface water has been conducted at the Site for purposes unrelated to the SCE. The data have been provided to the DEQ in previously submitted reports and are also summarized in Tables 1 and 3.

### 5.1.1 Catch Basin Sediment Sampling

### Sampling Framework

The purpose of the catch basin sediment sampling was to provide further data to establish Site-specific stormwater discharge COCs. Two samples were collected from catch basin CB-1. Laboratory analysis of the fine-grained sediments assisted in the identification of COIs that may not be detected in stormwater, such as hydrophobic PCBs and SVOCs. Sediment sampling results, in conjunction with historic catch basin sediment sampling data that exists for the Site, have assisted in the evaluation of the on-going effectiveness of SCMs and BMPs implemented at the Site.

#### Sampling Location Rationale

The rationale for selecting catch basin CB-1 as the sample location is presented below:

- Stormwater runoff from impervious surfaces in portions of the Site where industrial activities are conducted is diverted to catch basin CB-1, which serves as the representative catch basin sediment sampling location.
- Catch basin CB-1 is located near the eastern portion of the Site and east of the receiving/loading dock area of the Site (Figure 2). Catch basin CB-1 is the approved catch basin sediment sampling location that is used to satisfy the requirements of the NPDES General Permit.
- Catch basins CB-2 and CB-3, located in the right-of-way of NW St. Helens Road, are not representative of stormwater from the Site due to the collection of runoff from the NW St. Helens Road, and do not receive stormwater flow from areas where product blending, transfer, or storage operations are conducted.

A Catch Basin Sediment Sample Location Summary is provided as Table 4.

#### Analytical Suite Rationale

In accordance with the SCE Work Plan, catch basin sediment samples were analyzed based upon previously identified COIs for the Site; historical and current Site operations; past environmental investigations; materials stored/handled at the Facility; compliance history with regulatory permits; and the COCs related to Outfall #18 on the Willamette River. On the basis of these criteria, the following COIs were of primary concern:

- TPH as GRO by Northwest Method NWTPH-Gx;
- TPH as DRO and ORO by Northwest Method NWTPH-Dx;
- PAHs and phthalates by EPA Method 8270D SIM;
- Total Metals (arsenic, barium, cadmium, chromium, copper, lead, manganese, mercury, nickel, selenium, silver and zinc) by EPA Method 200.8;
- SVOCs by EPA Method 8270D; and
- PCB Aroclors by EPA Method 8082A.

Catch basin sediment samples were also analyzed for TOC (Method SW-846 9060), TSS (Method SM 2540G), and grain size distribution (Method ASTM D422).

#### Sampling Schedule

Catch basin sediment sampling was conducted prior to the stormwater sampling events and was used to develop an appropriate analytical suite for the stormwater samples. Christenson Oil conducts biannual sediment removal from catch basin CB-1 in the spring and fall. Catch basin sediment samples were collected prior to catch basin sediment removal to ensure sufficient sediment availability.

#### Sampling Collection Methodology

Catch basin sediment sampling was conducted in accordance with sample collection and documentation procedures described in *Standard Operating Procedures: Guidance for Sampling of Catch Basin Solids*, developed by the COP BES. The SOP provides detailed information regarding equipment and materials, procedures, sample acceptability, documentation, quality assurance, and quality control.

Sample collection included obtaining samples from both the filter fabric and the bottom of the catch basin. Samples were assigned a unique sample identifier which includes the following:

- Sample Medium (Sed);
- Sample location (CB-1);
- Sample position in catch basin (filter [F] or bottom [B]); and
- Sample date (mm/dd/yy).

Following collection, sediment samples were placed into appropriate containers supplied by the analytical laboratory. The sample containers were placed into a cooler and submitted to Friedman & Bruya, Inc. of Seattle, Washington (Friedman & Bruya), an Oregon Environmental Laboratory Accreditation Program analytical laboratory, under standard chain-of-custody protocol.

#### Documentation

Sampling of catch basin filter fabric and sediment from catch basin CB-1 was conducted under the direction of Wohlers field personnel on December 1, 2010. The catch basin sediment sampling event was conducted in accordance with both the SCE Work Plan and the Standard Operating Procedures: Guidance for Sampling of Catch Basin Solids (Catch Basin Sampling

SOP) developed by the COP BES. No deviations from the SCE Work Plan or the Catch Basin Sampling SOP were reported by Wohlers field personnel.

Pacific Crest reviewed field records, observations and measurements to ensure that procedures were properly followed and documented. The review included:

- Verification of completeness and legibility of field reports and sampling forms;
- Collection and preparation of field quality control samples;
- Equipment calibration and maintenance; and
- Completion of Chain-of-Custody forms.

The laboratory identified the following data quality issue in its QA/QC assessment of the catch basin sample analysis:

• The 8260C relative percent difference from the laboratory control sample and laboratory control sample duplicate analysis was outside of control limits for several compounds. The compounds were not detected, therefore the data were considered acceptable.

Pacific Crest identified the following data quality issues in its QA/QC assessment:

- 3,3-dichlorobenzidine and n-nitrosodimethylanine were not included in the analyte list for SVOC analysis and analytical results are not available. Neither compound is common. The missing data does not change the SCE conclusions.
- SVOC analysis for both samples collected from catch basin CB-1 required dilution by the
  laboratory in order to complete the analysis, and, as a result, laboratory method
  detection limits (MDLs) were elevated. The MDLs exceeded the SLVs for 1,3dichlorobenzene; 1,4-dichlorobenzene; hexachlorobutadiene;
  hexachlorocyclopentadiene; phenol; 2, 4, 6- trichlorophenol; pentachlorophenol; diethyl
  phthalate; and, di-n-butyl phthalate. The data is considered usable because SVOCs,
  other than phthalates, are not the primary COIs for the Site.

### 5.1.2 Stormwater Sampling

#### Sampling Framework

The purpose of collecting one stormwater sample (four samples total) during four separate storm events was to provide information on the types and concentrations of COIs in stormwater effluent discharged from the Site to evaluate potential effects to the receiving waterbody.

### Sampling Location Rationale

The rationale for selecting a location upstream of the connection between the Site stormwater system and the shared stormwater conveyance system as the sample location is presented below:

 Catch basin CB-1 collects stormwater from impervious surfaces in Basin A and subsurface utility piping conveys the stormwater to the OWS, which separates oil and suspended solids from the stormwater before discharging stormwater to the shared storm sewer conveyance system located in NW St. Helens Road. • Due to the conveyance of stormwater on the Site, the OWS point of discharge is representative of stormwater leaving the Site.

#### Analytical Suite Rationale

In accordance with the SCE Work Plan, stormwater samples were analyzed based on previously identified COIs for the Site; historical and current Site operations; past environmental investigations; materials stored/handled at the Facility; compliance history with regulatory permits; and the COCs related to Outfall #18 on the Willamette River.

The stormwater samples were analyzed for the following COIs:

- TPH as GRO by Northwest Method NWTPH-Gx;
- TPH as DRO and ORO by Northwest Method NWTPH-Dx;
- PAHs and phthalates by EPA Method 8270D SIM;
- Total metals (arsenic, barium, cadmium, chromium, copper, lead, manganese, mercury, nickel, selenium, silver and zinc) by EPA Method 200.8;
- SVOCs by EPA Method 8270D; and
- PCB Aroclors by EPA Method 8082A.

The stormwater samples were also analyzed for TOC (Method SM 5310B) and TSS (Method 2540D).

# 5.1.3 Sampling Collection Methodology

Stormwater sampling events were completed with the following criteria:

- Each stormwater event was preceded by a 24-hour dry period (less than 0.1 inches of accumulative rainfall);
- A minimum rainfall of 0.2-inches occurred during an event having a minimum duration of 3 hours; and
- All four samples were identified by Wohlers as being collected during representative "first flush" conditions of the storm event (i.e., stormwater samples were collected within the first 30 minutes of stormwater discharge from the Site).

Hydrograph rainfall data was collected from the USGS Yeon Street rain gauge located at 3395 NW Yeon Street in Portland, Oregon.

Stormwater samples were collected as grab samples at discrete time intervals. Sampling was conducted in accordance with the Washington State Department of Ecology (Ecology) guidance document *Standard Operating Procedure for Collecting Grab Samples from Stormwater Discharges* (Stormwater SOP), dated September 16, 2009.

The samples were assigned a unique sample identifier which includes the following:

- Sample Medium (SW);
- Sample location (OWS);

- Sample position in OWS (effluent [EF]); and
- Sample date (mm/dd/yy).

For example, the stormwater sample collected from the OWS effluent on May 21, 2012 has the identifier: SW-OWS-EF-052112.

Following collection, stormwater samples were placed into appropriate containers supplied by the analytical laboratory. The sample containers were then placed into a cooler and submitted to Friedman & Bruya under standard chain-of-custody protocol.

### **Documentation**

Stormwater sampling was conducted under the direction of Wohlers field personnel on the following dates: November 16, 2011; January 29, 2012; March 5, 2012; and May 21, 2012. The stormwater sampling was conducted in accordance with the Stormwater SOP and the SCE Work Plan. No deviations from the SCE Work Plan or the SOP were reported by Wohlers field personnel. The following table includes the duration of the antecedent dry period for each of the sampled storm events.

Sample ID	Antecedent Dry Period (hours)
SW-OWS-EF-111611	394
SW-OWS-EF-012912	97
SW-OWS-EF-030512	76
SW-OWS-EF-052112	79

Hydrographs for the storm events showing the rainfall distribution for the time period beginning 24 hours prior to the storm events through the completion of the event is provided as Figure 6.

Pacific Crest reviewed field records, observations and measurements to ensure that procedures were properly followed and documented. The review included:

- Verification of completeness and legibility of field reports and sampling forms;
- Collection and preparation of field quality control samples;
- Equipment calibration and maintenance; and
- Completion of Chain-of-Custody forms.

Laboratory analytical reports for each of the stormwater samples reported the following with regard to the QA/QC assessment:

- SW-OWS-EF-111611:
  - The 8270D calibration standard failed the acceptance criteria for fluorene. In addition, the laboratory control sample and laboratory control sample duplicate failed below the acceptance criteria for fluorene. The results are flagged accordingly.
  - The 8270D n-nitrosodimethylamine laboratory control sample and laboratory control sample duplicate failed below the acceptance criteria. The results are flagged accordingly.

- The 8260C laboratory control sample and laboratory control sample duplicate failed the relative percent difference for benzoic acid. The analyte was not detected therefore the data were acceptable.
- The sample was sent to Amtest, Inc. of Kirkland, Washington (Amtest) for the TOC analysis. Review of the report indicated that all quality assurance data were acceptable.

#### SW-OWS-EF-012912:

- Several compounds in the 8270D laboratory control sample and laboratory control sample duplicate failed the acceptance criteria. The results are flagged accordingly.
- The sample was sent to Aquatic Research, Inc. of Seattle, Washington (Aquatic Research) for the TOC analysis. Review of the report indicated that all quality assurance data were acceptable.

#### SW-OWS-EF-030512:

- Chrysene in the laboratory control sample duplicate failed the acceptance criteria.
   The data were flagged accordingly.
- The sample was sent to Amtest for the TOC analysis. Review of the report indicated that all quality assurance were acceptable.

#### SW-OWS-EF-052112:

• The sample was sent to Amtest for the TOC analysis. Review of the report indicated that all quality assurance were acceptable.

Pacific Crest's review of the QA/QC measures indicates the following:

- The sampling objectives were met.
- The following analytes were identified to have a laboratory method reporting limits (MRLs) exceeding the JSCS SLV in stormwater during one or more sampling events: hexachlorobenzene. hexachlorocyclopentadiene, bis-(2-chloroethyl)ether, chlorophenyl-phenyl ether. 3,3'-dichlorobenzidine, 4-nitroanaline. n-BEHP, nitrosodimethylamine, n-nitroso-di-n-propylamine, pentachlorophenol, methylnapthalene, Aroclor #1221, Aroclor #1232, Aroclor #1242, Aroclor #1248. Aroclor #1254, Aroclor #1260 and arsenic. The MRLs were consistent with the target MRLs presented in the SCE Workplan.
- Wohlers field personnel noted the presence of tree pollen in the stormwater sample SW-OWS-EF-052112, and on the surface of the water in the OWS. Tree pollen was not noted during previous sampling events. The presence of tree pollen in stormwater sample SW-OWS-EF-052112 increases the level of uncertainty regarding the nature and sources of the concentrations of metals detected in the sample, but does not affect the representativeness of the sample. Further discussion regarding the presence of pollen in sample SW-OWS-EF-052112 is included in Section 5.3.3.
- The representativeness of the samples are not affected by unusual activities occurring
  on the site prior to the sampling event; unusually long or short antecedent dry periods;
  timing of sample collection during each storm event or volume and intensity of rainfall
  during each storm event.

### 5.1.4 Oil Water Separator Sediment Sampling

Sampling of accumulated sediment within the on-Site OWS was conducted at the request of DEQ and was not a work scope item in the SCE Work Plan. The OWS sediment sampling was conducted in a manner consistent with catch basin sediment sampling methodology presented in the SCE Work Plan.

#### Sampling Framework

The purpose of the OWS sediment sampling was to assess the nature of the fine grained sediment that could potentially be discharged from the Site during a high flow storm event. One sample of sediment was collected from the OWS for laboratory analysis.

#### Sampling Location Rationale

The rationale for the sampling location is presented below:

 The OWS consists of three internal compartments (influent, middle, and effluent bay), which assist in the separation of oil and TSS from stormwater. Sediment from the middle bay of the OWS is most likely to be representative of material that could potentially be discharged during a high flow storm event.

#### Analytical Suite Rationale

The OWS sediment samples were analyzed based upon previously identified COIs for the Site; historical and current Site operations; past environmental investigations; materials stored/handled at the Facility; compliance history with regulatory permits; and the COCs related to Outfall #18 on the Willamette River.

The sediment sample was analyzed for the following COIs:

- TPH as GRO by Northwest Method NWTPH-Gx;
- TPH as DRO and ORO by Northwest Method NWTPH-Dx;
- PAHs and phthalates by EPA Method 8270D SIM;
- Total Metals (arsenic, barium, cadmium, chromium, copper, lead, manganese, mercury, nickel, selenium, silver and zinc) by EPA Method 200.8; and,
- PCB Aroclors by EPA Method 8082A.

OWS sediment samples were also analyzed for TOC (Method SW-846 9060), sample moisture, and grain size distribution (Method ASTM D422).

#### Sample Collection Methodology

OWS sediment sampling was conducted in accordance with sample collection and documentation procedures described in *Standard Operating Procedures: Guidance for Sampling of Catch Basin Solids* developed by the COP BES. The SOP provides detailed information regarding equipment and materials, procedures, sample acceptability, documentation, quality assurance, and quality control.

Following collection, the sediment sample was placed into appropriate containers supplied by the analytical laboratory. The sample container was placed into a cooler and submitted to Friedman & Bruya under standard chain-of-custody protocol.

The sample was assigned a unique sample identifier which includes the following:

- Sample Medium (SED);
- Sample location (OWS);
- Sample number (1); and,
- Sample date (mm/dd/yy).

The sediment sample collected from the middle bay of the OWS on September 20, 2012 has the identifier: SED-OWS-1-092012.

#### **Documentation**

OWS sediment sampling was conducted under the direction of Wohlers field personnel on September 20, 2012. The OWS sediment sampling was conducted in accordance with the Catch Basin Sampling SOP, as applicable. Due to an unintentional oversight by field personnel, SED-OWS-1-092012 was not analyzed for SVOCs by EPA Method 8270D. Consideration was given to resample the OWS sediment in order to analyze for SVOCs, more specifically phthalates; however, it was ultimately decided that the SVOC analysis alone did not warrant the collection of an additional sediment sample based on the historically low detection occurrence for SVOCs.

Pacific Crest reviewed field records, observations and measurements to ensure that procedures were properly followed and documented. The review included:

- Verification of completeness and legibility of field reports and sampling forms;
- Collection and preparation of field quality control samples;
- Equipment calibration and maintenance; and
- Completion of Chain-of-Custody forms.

The laboratory analytical report for sediment sample SED-OWS-1-092012 reported the following with regard to the QA/QC assessment:

 The sample was sent to Fremont Analytical of Seattle, Washington for the TOC and grain size analyses. Review of the report indicated that all quality assurance were acceptable.

All quality control requirements were acceptable.

#### 5.2 DATA SUMMARY

### 5.2.1 Catch Basin Sediment Data Summary

### 5.2.1.1 SED-CB-1-F-120110

Laboratory analytical results for catch basin filter sediment sample SED-CB-1-F-120110 are summarized as follows:

- Laboratory analysis detected a concentration of indeno(1,2,3-cd)pyrene of 0.18 mg/kg, exceeding the JSCS SLV for indeno(1,2,3-cd)pyrene of 0.1 mg/kg.
- Laboratory analysis detected a concentration of cadmium of 1.56 mg/kg, exceeding the JSCS SLV for cadmium of 1 mg/kg.
- Laboratory analysis detected a concentration of lead of 50.2 mg/kg, exceeding the JSCS SLV for lead of 17 mg/kg.
- Laboratory analysis detected a concentration of bis(2-ethylhexyl)phthalate (BEHP) of 32 mg/kg, exceeding the JSCS SLV for BEHP of 0.33 mg/kg.
- Based on the dry weight of the sample, total solids equaled 41.7%.
- TOC was detected at a concentration of 5.8%.
- Grain size distribution analysis results indicate the sample consisted of: sand (65.0%), gravel (19.4%), silt (12.8%), and clay (2.70%).

Concentrations were either not detected at or above the SLVs or were not detected above the laboratory MDL for the remaining COIs analyzed in sample SED-CB-1-F-120110.

#### 5.2.1.2 SED-CB-1-B-120110

Laboratory analytical results for the catch basin bottom sediment sample SED-CB-1-B-120110 are summarized as follows:

- Laboratory analysis detected a concentration of benzo(g,h,i)perylene of 0.37 mg/kg, exceeding the JSCS SLV for benzo(g,h,i)perylene of 0.3 mg/kg.
- Laboratory analysis detected a concentration of indeno(1,2,3-cd)pyrene of 0.28 mg/kg, exceeding the JSCS SLV for indeno(1,2,3-cd)pyrene of 0.1 mg/kg.
- Laboratory analysis detected a concentration of cadmium of 2.87 mg/kg, exceeding the JSCS SLV for cadmium of 1 mg/kg.
- Laboratory analysis detected a concentration of lead of 84.6 mg/kg, exceeding the JSCS SLV for lead of 17 mg/kg.
- Laboratory analysis detected a concentration of zinc of 584 mg/kg, exceeding the JSCS SLV for zinc of 459 mg/kg.
- Laboratory analysis detected a concentration of BEHP of 38 mg/kg, exceeding the JSCS SLV for BEHP of 0.33 mg/kg.
- Based on the dry weight of the sample, total solids equaled 42.6%.
- TOC was detected at a concentration of 7.4%.
- Grain size distribution consisted of sand (79.2%), silt (18.1%), gravel (1.60%) and clay (1.20%).

Concentrations were either not detected at or above the SLVs or were not detected above the laboratory MDL for the remaining COIs analyzed in sample SED-CB-1-B-120110. The catch basin sediment sampling location and analytical results are presented on Figures 7 through 9.

Summarized analytical data is provided in Table 5. Laboratory analytical reports are provided in Appendix E.

### **5.2.2 Stormwater Data Summary**

#### 5.2.2.1 SW-OWS-EF-111611

Laboratory analytical results for the stormwater sample collected on November 16, 2011 (SW-OWS-EF-111611) are summarized as follows:

- Laboratory analysis detected a concentration of cadmium of 0.194 μg/l, exceeding the JSCS SLV for cadmium of 0.094 μg/l.
- Laboratory analysis detected a concentration of copper of 5.04 μg/l, exceeding the JSCS SLV for copper of 2.7 μg/l.
- Laboratory analysis detected a concentration of lead of 3.70  $\mu$ g/l, exceeding the JSCS SLV for lead of 0.54  $\mu$ g/l.
- Laboratory analysis detected a concentration of nickel of 1.28  $\mu$ g/l, exceeding the JSCS SLV for nickel of 0.0028  $\mu$ g/l.
- Laboratory analysis detected a concentration of zinc of 116  $\mu$ g/l, exceeding the JSCS SLV for zinc of 36  $\mu$ g/l.
- TOC was detected at a concentration of 3.5 mg/l.
- TSS were detected at a concentration of 14 mg/l.

Concentrations were either not detected at or above the SLVs or were not detected above the laboratory MDL for the remaining COIs analyzed in sample SW-OWS-EF-111611.

#### 5.2.2.2 SW-OWS-EF-012912

Laboratory analytical results for the stormwater sample collected on January 29, 2012 (SW-OWS-EF-012912) are summarized as follows:

- Laboratory analysis detected a concentration of cadmium of 0.213  $\mu$ g/l, exceeding the JSCS SLV for cadmium of 0.094  $\mu$ g/l.
- Laboratory analysis detected a concentration of copper of 3.28 μg/l, exceeding the JSCS SLV for copper of 2.7 μg/l.
- Laboratory analysis detected a concentration of lead of 2.29 μg/l, exceeding the JSCS SLV for lead of 0.54 μg/l.
- Laboratory analysis detected a concentration of zinc of 121  $\mu g/l$ , exceeding the JSCS SLV for zinc of 36  $\mu g/l$ .
- TOC was detected at a concentration of 1.27 mg/l.
- TSS were not detected above the MDL.

Concentrations were either not detected at or above the SLVs or were not detected above the laboratory MDL for the remaining COIs analyzed in sample SW-OWS-EF-012912.

#### 5.2.2.3 SW-OWS-EF-030512

Laboratory analytical results for the stormwater sample collected on March 5, 2012 (SW-OWS-EF-030512) are summarized as follows:

- Laboratory analysis detected a concentration of benzo(a)anthracene of 0.021 μg/l, exceeding the JSCS SLV for benzo(a)anthracene of 0.018 μg/l.
- Laboratory analysis detected a concentration of chrysene of 0.030 μg/l, exceeding the JSCS SLV for chrysene of 0.018 μg/l.
- Laboratory analysis detected a concentration of benzo(b)fluoranthene of 0.033 μg/l, exceeding the JSCS SLV for benzo(b)fluoranthene of 0.018 μg/l.
- Laboratory analysis detected a concentration of benzo(a)pyrene of 0.025 μg/l, exceeding the JSCS SLV for benzo(a)pyrene of 0.018 μg/l.
- Laboratory analysis detected a concentration of indeno(1,2,3-cd)pyrene of 0.033 μg/l, exceeding the JSCS SLV for indeno(1,2,3-cd)pyrene of 0.018 μg/l.
- Laboratory analysis detected a concentration of cadmium of 0.159 μg/l, exceeding the JSCS SLV for cadmium of 0.094 μg/l.
- Laboratory analysis detected a concentration of copper of 4.12 μg/l, exceeding the JSCS SLV for copper of 2.7 μg/l.
- Laboratory analysis detected a concentration of lead of 2.36 μg/l, exceeding the JSCS SLV for lead of 0.54 μg/l.
- Laboratory analysis detected a concentration of zinc of 111  $\mu$ g/l, exceeding the JSCS SLV for zinc of 36  $\mu$ g/l.
- TOC was detected at a concentration of 5.1 mg/l.
- TSS were not detected above the MDL.

Concentrations were either not detected at or above the SLVs or were not detected above the laboratory MDL for the remaining COIs analyzed in sample SW-OWS-EF-030512.

#### 5.2.2.4 SW-OWS-EF-052112

Laboratory analytical results for the stormwater sample collected on May 21, 2012 (SW-OWS-EF-052112) are summarized as follows:

- Laboratory analysis detected arsenic at a concentration of 0.763  $\mu$ g/l, exceeding the JSCS SLV for arsenic of 0.045  $\mu$ g/l.
- Laboratory analysis detected cadmium at a concentration of 0.649  $\mu$ g/l, exceeding the JSCS SLV for cadmium of 0.094  $\mu$ g/l.
- Laboratory analysis detected copper at a concentration of 12.7 μg/l, exceeding the JSCS SLV for copper of 2.7 μg/l.
- Laboratory analysis detected lead at a concentration of 2.45  $\mu g/l$ , exceeding the JSCS SLV for lead of 0.54  $\mu g/l$ .

- Laboratory analysis detected nickel at a concentration of 3.08 μg/l, exceeding the JSCS SLV for nickel of 0.0028 μg/l.
- Laboratory analysis detected zinc at a concentration of 291  $\mu$ g/l, exceeding the JSCS SLV for zinc of 36  $\mu$ g/l.
- TOC was detected at a concentration of 27 mg/l.
- TSS were not detected above the laboratory MDL.

For the remaining COCs analyzed in sample SW-OWS-EF-052112, analyte concentrations were either not detected at or above the laboratory MDL, or the COCs were detected at concentrations below the corresponding JSCS SLV.

Stormwater sampling locations and analytical results are presented on Figures 10 through 12. Summarized analytical data is provided in Table 6. Laboratory analytical reports are provided in Appendix E.

### 5.2.3 Oil Water Separator Sediment Data Summary

Laboratory analytical results for OWS sediment sample SED-OWS-1-092012 are summarized as follows:

- Laboratory analysis detected a concentration of indeno(1,2,3-cd)pyrene of 0.42 mg/kg, exceeding the JSCS SLV for indeno(1,2,3-cd)pyrene of 0.1 mg/kg.
- Laboratory analysis detected a concentration of benzo(g,h,i)perylene of 0.43 mg/kg, exceeding the JSCS SLV for benzo(g,h,i)perylene of 0.3 mg/kg.
- Laboratory analysis detected a concentration of zinc of 752 mg/kg, exceeding the JSCS SLV for zinc of 459 mg/kg.
- Based on the dry weight of the sample, total solids equaled 39.7%.
- TOC was detected at a concentration of 13.8%.

For the remaining COCs analyzed in sample SED-OWS-1-092012, analyte concentrations were either not detected at or above the laboratory MDL, or the COCs were detected at concentrations below the corresponding JSCS SLV.

The OWS sediment sampling location and analytical results are presented on Figures 13 through 15. Summarized analytical data is provided in Table 5. The laboratory analytical report is provided in Appendix E.

#### 5.3 DATA INTERPRETATION

### 5.3.1 Method Detection Level and QA/QC

The following analytes were identified to have a laboratory MDL exceeding the JSCS SLV in sediment:

 1,3-dichlorobenzene, 1,4-dichlorobenzene, hexachlorobenzene, hexachlorobutadiene, hexachlorocyclopentadiene, phenol, pentachlorophenol, diethyl phthalate, di-n-butyl phthalate, and mercury. The following analytes were identified to have a laboratory MDL exceeding the JSCS SLV in stormwater:

Hexachlorobenzene, hexachlorocyclopentadiene, bis-(2-chloroethyl)ether, 3,3'-dichlorobenzidine, 4-nitroanaline, n-nitrosodimethylamine, n-nitroso-di-n-propylamine, pentachlorophenol, BEHP, 2-methylnapthalene, Aroclor #1221, Aroclor #1232, Aroclor #1242, Aroclor #1248, Aroclor #1254, Aroclor #1260 and arsenic.

### 5.3.2 SLV Exceedances

The following table summarizes the SLV exceedances in the SCE data:

Catch Basin Sediment								
			Magnitude of					
		Concentration	SLV					
Sample ID	COC	(mg/kg)	Exceedance					
	Bis(2-ethylhexyl)phthalate	32	96.97					
SED-CB-1-F-120110	Indeno(1,2,3-cd)pyrene	0.18	1.8					
3ED-0B-1-F-120110	Cadmium	1.56	1.56					
	Lead	50.2	2.95					
	Bis(2-ethylhexyl)phthalate	38	115.15					
	Indeno(1,2,3-cd)pyrene	0.28	2.8					
SED-CB-1-B-120110	Benzo(g,h,i)perylene	0.37	1.23					
3LD-0D-1-D-120110	Cadmium	2.87	2.87					
	Lead	84.6	4.98					
	Zinc	584	1.27					
OWS Sediment								
			Magnitude of					
		Concentration	SLV					
Sample ID	COC	(mg/kg)	Exceedance					
	Indeno(1,2,3-cd)pyrene	0.42	4.2					
SED-OWS-1-092012	Benzo(g,h,i)perylene	0.43	1.43					
	Zinc	752	1.64					
Stormwater								
			Magnitude of					
		Concentration	SLV					
Sample ID	COC	(μg/I)	Exceedance					
	Cadmium	0.194	2.06					
	Copper	5.04	1.87					
SW-OWS-EF-111611	Lead	3.7	6.85					
	Nickel	1.28	457.14					
	Zinc	116	3.22					
	Cadmium	0.213	2.27					
SW-OWS-EF-012912	Copper	3.28	1.21					
300-0003-L1-012912	Lead	2.29	4.24					
	Zinc	121	3.36					
	Benzo(a)anthracene	0.021	1.17					
	Chrysene	0.03	1.67					
	Benzo(b)fluoranthene	0.033	1.83					
	Benzo(a)pyrene	0.025	1.39					
SW-OWS-EF-030512	Indeno(1,2,3-cd)pyrene	0.033	1.83					
	Cadmium	0.159	1.69					
	Copper	4.12	1.53					
	Lead	2.36	4.37					
	Zinc	111	3.08					
	Arsenic	0.763	16.96					
	Cadmium	0.649	6.9					
	Copper	12.7	4.7					
SW-OWS-EF-052112	Lead	2.45	4.54					
	Manganese	230	4.6					
	Nickel	3.08	1,100					
	Zinc	291	8.08					

Note: the magnitude of exceedance was determined by dividing the detected concentration by the applicable SLV.

### 5.3.3 Discussion

In general, SCE data trends are indicative of typical stormwater discharges associated with light industrial activities. Minor exceedances of a limited number of COIs observed in the SCE data are reflective of the conservative nature of the JSCS SLVs, rather than the inadequacy of stormwater SCMs and BMPs at the Site. Data uncertainty regarding SVOCs in oil-water sediment and metals in stormwater are discussed in further detail below:

- Due to an unintentional oversight by field personnel, sediment sample SED-OWS-1-092012 was not analyzed for SVOCs by EPA Method 8270D. Consideration was given to resample the OWS sediment in order to analyze for SVOCs, more specifically phthalates; however, it was ultimately decided that the SVOC analysis alone did not warrant the collection of an additional sediment sample based on the historically low detection occurrence for SVOCs. Catch basin sediment samples detected concentrations of BEHP which exceeded the JSCS SLV for BEHP; however, in comparison to Risk-Based Concentration Levels based on various receptor scenarios for direct and indirect pathways, the concentrations detected at the Site appear to be of minimal concern. Furthermore, BEHP was not detected in any of the stormwater samples.
- Laboratory analysis of stormwater sample SW-OWS-EF-052112 detected certain heavy metals at elevated concentrations relative to results from previous sampling events. The field sampling technician noted the unusual presence of pollen in the stormwater sample. Studies (Perugini et al, 2011) (Botré and Conti, 2001) have documented the propensity of pollen to absorb and bioaccumulate heavy metals, particularly in urban or industrial locations. The anomalous concentrations of metals detected in stormwater sample SW-OWS-EF-052112 appear to be attributable to the presence of pollen in the stormwater sample rather than to anthropogenic sources at the Site.

### **6.0 SOURCE CONTROL MEASURES**

This section presents a description of SCMs implemented at the Site to minimize exposure and remove potential sources from the stormwater pathway prior to discharging from the Site. SWPPCMs include those measures presented in the SWPCP as well as additional engineered controls implemented since the SWPCP was adopted in 2001. The SWPCP was prepared in accordance with the requirements of the NPDES General Permit issued for the Site. The SWPCP includes a spill prevention and response plan, BMPs and SCMs designed to minimize the potential for released pollutants to enter the stormwater pathway, or to remove pollutants from stormwater before discharging from the Site.

Additional engineering controls implemented by Christenson Oil to enhance SWPPCMs include the 2002 installation of a new OWS and catch basin (CB-1), and repaving of the asphalt surface between the loading dock and NW St. Helens Road. Additionally, a two stage filter was installed in catch basin CB-1 in 2006, which includes a metal debris basket and a vermiculite filter designed to pick up O&G. TSS and pollutants associated with TSS. The SCMs implemented at the Site are described in greater detail below.

### 6.1 CATCH BASIN AND OIL WATER SEPARATOR INSTALLATION

In 2002, a catch basin CG-1 was installed as a replacement of an existing catch basin; a 6,300 gallon capacity OWS was installed at the Site to intercept stormwater received by catch basin CB-1 prior to discharging into the COP stormwater conveyance system; and, area between the loading dock and NW St. Helens Road was repaved with asphalt. The new catch basin and OWS were selected as SCMs for the Site for the purpose of segregating TSS and emulsified oil from stormwater. The objective of the selected SCMs was to eliminate or reduce the concentrations of pollutants with the potential to negatively impact the receiving waterbody to be discharged in stormwater from the Site. The OWS is cleaned and/or maintained on a semi-annual schedule, generally in the spring and fall. The effectiveness of the SCM is demonstrated by a comparison of pre- and post-installation sampling data, as well as the observed accumulations of materials within the OWS.

### 6.2 CB-1 TWO-STAGE FILTER

In 2006, a two stage filter was installed in catch basin CB-1 which included a metal debris basket and a vermiculite filter designed to reduce the potential for O&G, TSS or other pollutants associated with TSS from entering the stormwater system. The two-stage filter was selected as an SCM to reduce the volume and concentration of TSS and associated pollutants from entering into the stormwater conveyance system. The catch basin filter is cleaned and/or maintained on a semi-annual basis, generally in the spring and fall. The effectiveness of the SCM is demonstrated by a comparison of pre- and post-installation data, as well as the visible sediment load captured by the filter.

### 7.0 SOURCE CONTROL EVALUATION

### 7.1 DATA EVALUATION

An evaluation of stormwater and sediment data collected at the Site over the course of time demonstrates the elimination or significant decline in COI concentrations resulting from the implementation of various effective SCMs, BMPs and preventative measures. Data charts provided as Appendix F visually compare historical and recent stormwater data. The reduction in concentrations of Site COIs and TSS following the installation of the OWS system and the two-stage catch basin filter clearly supports the effectiveness of the SCMs.

Inherent to industrial operations are activities with the potential to result in minor releases of contaminants, despite excellent stormwater management practices. In general, possible releases from industrial facilities include: petroleum products in drips of oils, greases and fuels used for vehicles and machinery; phthalates off-gassing from paints and PVC piping; and zinc resulting from forklift tire dust, hydraulic oil drips and galvanized building surfaces. Offsite sources including highway traffic, operations at neighboring sites and atmospheric deposition may also contribute to the contaminant load in stormwater runoff from the Site. As discussed previously, recent stormwater and sediment data are indicative of typical stormwater discharges associated with light industrial activities. Minor exceedances of a limited number of COCs observed in the SCE data are reflective of the conservative nature of the JSCS SLVs, rather than the inadequacy of stormwater SCMs and BMPs at the Site.

Consistent with the information presented in the *Guidance for Evaluating the Stormwater Pathway at Upland Sites – Appendix E: Tool for Evaluating Stormwater Data* (DEQ, 2010), analytical results suggest that stormwater is not being unusually impacted by contaminants at the Site and is therefore representative of "typical" industrial stormwater for Portland Harbor sites. As stated in DEQ's guidance document, industrial stormwater is likely to contain a somewhat predictable list of contaminants within a predictable concentration range even when good stormwater management practices are being implemented. Each of the stormwater COI SLV exceedances from the Site are included in the list of predictable contaminants and fall within the predictable concentration range provided by DEQ. No other lines of evidence indicate that discharges from the Site are likely to have an unacceptable impact on the receiving waterbody.

SCMs and preventative measures implemented at the Site, as well as continued good housekeeping, are responsible for the considerable improvement in the quality of stormwater discharges. These measures will continue to be in place at the Site, as is required by the COP BES under the NPDES General Permit.

### 7.2 OTHER LINES OF EVIDENCE

The following additional lines of evidence were considered in the screening evaluation of SCE data.

### Discharges to 303(d) Listed Waterbodies

The following constituents exceed the Ambient Water Quality Criteria in the Willamette River for river miles 0 through 24.8: aldrin; DDT; DDT metabolite; dieldrin; dioxin (2,3,7,8-TCDD); iron; manganese; mercury; PCBs; pentachlorophenol; and PAHs. Discharges from the Site containing iron, manganese or PAHs at concentrations

exceeding their respective SLVs were more conservatively evaluated in order to protect the beneficial uses of the Willamette River. Concentrations of the aforementioned COCs have decreased significantly over the course of data collection at the Site and, based on DEQ guidance documents for stormwater screening, are well within the range of what are considered "typical" industrial stormwater discharges.

### **Outfall Sediments**

Based on contaminant concentrations in Willamette River sediment samples, Outfall#18 is within a river reach identified by EPA as an area of potential concern for PCBs, copper, lead, zinc, tributyltin, DDT, PAHs and phthalates, and by the LWG for PCBs, aldrin, and DDT. Special consideration was given to the possibility of significant contribution of any of these contaminants from the Site.

Between March 2007 and June 2009, the COP BES conducted an investigation of inline solids in the Outfall Basin #18 stormwater conveyance system to evaluate stormwater discharges representative of the mixed use basin (Basin #18) (COP, 2010). The investigation involved the subdivision of Basin #18 into the following subbasins: western subbasin, west-central subbasin, east-central subbasin and eastern subbasin. The western subbasin receives drainage from Forest Park and several industrial facilities in the vicinity of NW St. Helens Road, including Christenson Oil. Investigation results indicated that sources of PCBs, pesticides and metals are present in Basin #18 discharges, and that pollutant concentrations were significantly higher in two of the four subbasins sampled. Significant findings of the investigation as they pertain to the Site SCE are summarized below:

- PCBs were detected at concentrations exceeding JSCS Bioaccumulation and/or Toxicity SLVs from the west-central and east-central subbasin samples. PCBs were not detected in the western and eastern subbasin samples.
- Samples from the west-central and east-central subbasins exceeded JSCS
  Toxicity SLVs for arsenic, cadmium, copper, lead, manganese, nickel and zinc.
  Samples from the western subbasin did not exceed JSCS Toxicity SLVs for
  metals. There was insufficient volume to analyze for metals in the eastern
  subbasin.
- Few individual PAHs were detected in excess of the JSCS SLVs, and detections
  were within one order-of-magnitude of the SLVs. While a JSCS SLV for total
  PAH does not exist, total PAH concentrations in all samples collected from the
  western, west-central and east-central subbasins are considered low. There was
  insufficient volume to analyze for PAHs in the eastern subbasin.
- The only phthalate detected in any of the samples at somewhat elevated concentrations was BEHP. Although the BEHP concentrations in samples collected from the west-central and east-central subbasins are considered slightly elevated relative to the SLVs, the data as a whole do not indicate the presence of significant uncontrolled BEHP sources within the basin.
- Investigation of the western subbasin concluded that concentrations for all sediment contaminants were low and that no further source tracing is needed for the western subbasin at this time.

The findings of the Outfall #18 inline solids investigation strongly support the conclusions from Site-specific SCE data, which are that Site stormwater discharges are not causing or contributing to adverse impacts to the receiving waterbody, nor are they likely to do so.

### Periodicity of Site Activities

Consideration was given to the representativeness of catch basin sediment samples based on the potential for variability of Site activities. Catch basin CB-1 is cleaned/maintained on a semiannual basis, generally in the spring and fall. Timing of the catch basin sediment sampling was coordinated with Site personnel to ensure that sufficient and representative catch basin sediment had accumulated. Site operations are consistent and primarily include the loading and unloading of bulk lubricant products. Site operations occurring in the vicinity of catch basin CB-1 are primarily bulk truck and fork lift traffic near the receiving dock and the lubricant dispensing area.

### Future Stormwater Management

Ongoing oversight of stormwater management practices currently being implemented at the Site will continue through the issuance of the NPDES General Permit.

### 8.0 FINDINGS AND CONCLUSIONS

### Existing and potential facility-related contaminant sources have been identified and characterized.

- The source area at the Site includes that portion of the impervious surface of the Facility
  which flows toward and into catch basin CB-1. Potential sources of contamination
  include those associated with routine, light industrial activities. Specifically, these
  include:
  - Minor drips of oils, greases and fuels from bulk trucks and machinery. COIs include: TPH as GRO, DRO and ORO; PAHs; phthalates; and, metals.
  - Forklift and vehicle traffic resulting in tire dust and gradual erosion of asphalt surfaces. COIs include: metals; TPH as GRO, DRO and ORO; PAHs and, phthalates.
  - Stormwater runoff from the Main Building's galvanized roof. COIs include: metals.
  - o Atmospheric deposition of pollen and dust. COIs include: metals.
- Lines of evidence used to determine that all sources have been identified and characterized include the following:
  - Stormwater and sediment sampling was conducted in accordance with the applicable regulatory guidance documents. The sample results are considered to be representative of stormwater discharges from the Site.
  - The increased concentrations of heavy metals in stormwater sample SW-OWS-EF-052112 appear to be associated with the presence of pollen in the sample.
  - o Inspection of the Site's storm sewer conveyance system indicates that it is in good-working condition and shows no signs of disrepair. The inspection, in conjunction with the elevation survey of stormwater components, confirms the incomplete pathway between groundwater and the stormwater system.
  - Use of the regulatory screening tool provided by DEQ for the evaluation of stormwater data confirms that COC concentrations in stormwater are minor and do not implicate the need for additional SCMs. The consideration of additional lines of evidence further supports this conclusion.

### 2. Contaminant sources are being controlled to the extent feasible.

- Existing or potential sources at the Site are being controlled through the use of BMPs, preventative measures and the interception of contaminants through SCMs such as the two-stage filter in catch basin CB-1, the OWS system, and the secondary containment in tank farm areas.
- SCM and stormwater BMP effectiveness has been assessed through the evaluation of stormwater and sediment data collected at the Site over time. With the exception of zinc, each Site COI has seen a significant reduction in concentration or was eliminated entirely. Analytical data provide the basis for this evaluation.

- Contaminants that continue to exceed SLVs in stormwater following the implementation of SCMs include:
- Benzo(a)anthracene;
- Chrysene;
- Benzo(b)fluoranthene;
- Benzo(a)pyrene;
- Indeno(1,2,3-cd)pyrene
- Arsenic;
- Cadmium;
- Copper;
- Lead;
- Manganese;
- Nickel; and
- o Zinc.
- Contaminants that continue to exceed SLVs in sediment following the implementation of SCMs include:
- BEHP
- Indeno(1,2,3-cd)pyrene;
- Benzo(g,h,i)perylene;
- Cadmium;
- Lead; and
- Zinc.
- activities. Specifically, these include: Sources of the COIs listed above include those associated with routine, light industrial
- 0 Minor drips of oils, greases and fuels from bulk trucks and machinery;
- 0 Forklift and vehicle traffic resulting in tire dust and gradual erosion of asphalt
- 0 Stormwater runoff from the Main Building's galvanized metal roof; and
- Atmospheric deposition of dust and pollen.
- be concluded then that Site operations would need to disproportionately limit or stop stormwater runoff from the source area is currently treated by multiple SCMs, it appears unlikely that the implementation of additional SCMs would achieve better results. It can operations. SCMs implemented at the Site address all potential sources of stormwater contaminates upon discharge to catch basin CB-1, and have proven to be effective through the reduction of COC concentrations in stormwater samples. Because The relatively minor exceedances of Site COCs as compared to other Portland Harbor industrial sites demonstrate that stormwater BMPs are strictly adhered to during Site 으

entirely in order for there to be a substantial reduction or total elimination of COC detections in stormwater.

- 3. If pre- and post-SCM data was collected, post-SCM data supports the conclusion that the SCM is effective.
  - A comparison of stormwater analytical results for pre- and post-SCM sampling identifies a decrease in frequency of COCs detected at or above the SLVs. Data charts provided as Appendix F visually compare historical and recent stormwater data. The reduction in concentrations of Site COCs and TSS following the installation of the OWS system and the two-stage catch basin filter clearly supports the effectiveness of the SCMs. Sampling data collected prior to the initiation of the SCE are provided in Tables 1, 3, 7 and 8.
- 4. Adequate measures are in place to ensure source control and good stormwater management measures occur in the future.
  - On-going stormwater management measures, including employee education and training; debris removal; exposure reduction; and runoff diversion are in place at the Site to minimize risk of COCs migrating into the stormwater conveyance system. BMP and SCM effectiveness will continue to be evaluated by the COP BES and DEQ in accordance with the NPDES General Permit for the Site.
- 5. Contaminants in stormwater that continue to exceed SLVs in spite of SCMs and stormwater management measures are not likely to result in sediment contamination in the receiving waterbody or contribute to unacceptable risk.
  - The following findings and evaluation of the stormwater discharged from the Site determine that contaminants in stormwater are not likely to result in the contribution to unacceptable risk or sediment contamination in the Willamette River.
    - o Consistent with the information presented in the *Guidance for Evaluating the Stormwater Pathway at Upland Sites Appendix E: Tool for Evaluating Stormwater Data* (DEQ, 2010), analytical results suggest stormwater is not being unusually impacted by contaminants at the Site, and is representative of "typical" industrial stormwater for Portland Harbor sites. As stated in DEQ's guidance document, industrial stormwater is likely to contain a somewhat predictable list of contaminants within a predictable concentration range even when good stormwater management practices are being implemented. Each of the stormwater COC SLV exceedances from the Site are included in the list of predictable contaminants and fall within the predictable concentration range provided by DEQ.
    - o The findings of the COP BES Outfall #18 inline solids investigation (COP BES, 2010) are consistent with the Site-specific SCE data, which support a conclusion that the Site stormwater discharges are not causing or contributing to adverse impacts to the receiving waterbody, nor are they likely to do so.

- TSS was detected at 14 mg/l during the first stormwater sampling event, and was not detected above the laboratory MDL during the three subsequent sampling events.
- The total area from which stormwater runoff can be discharged from the Site to the stormwater conveyance system is approximately 12,660 square-feet.

### 9.0 REFERENCES

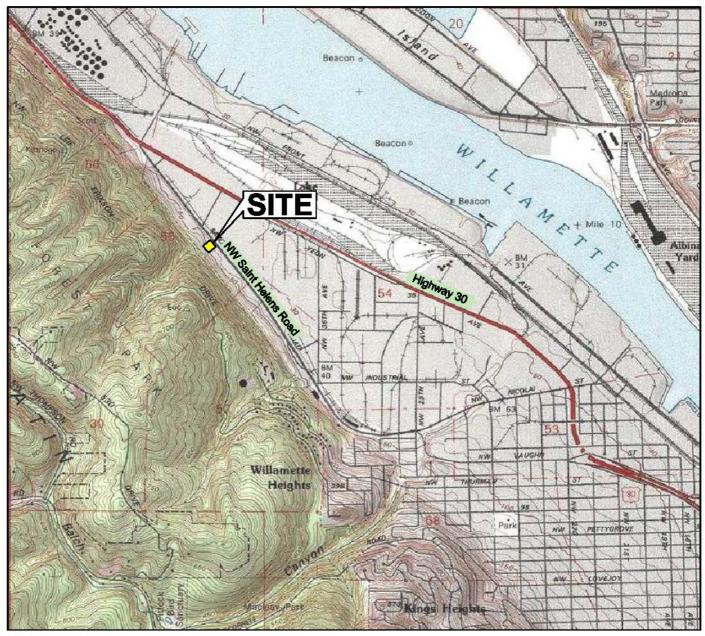
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  October
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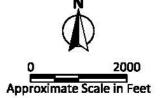
### **FIGURES**

SOURCE CONTROL EVALUATION REPORT CHRISTENSON OIL COMPANY PORTLAND, OREGON

> PACIFIC CREST NO. 123-001 ECSI NO. 2426



Source: TOPO! 2007



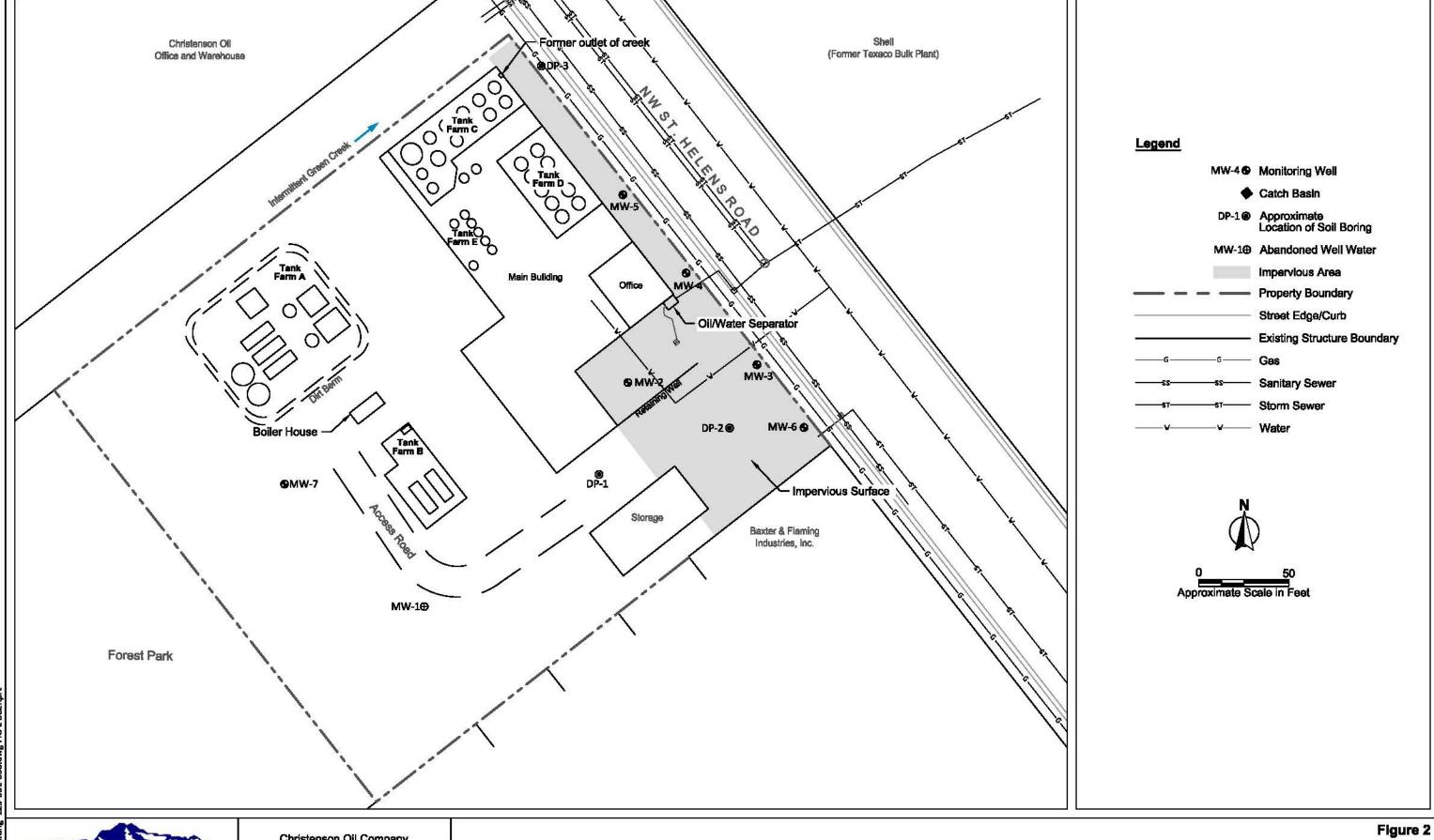


Christenson Oil Company 3821 N.W. St. Helens Rd. Portland, Oregon

PN: 123-001

Figure 1
Site Location Map

11/26/2013 Drafting 123-001-004.dwg FIG 1

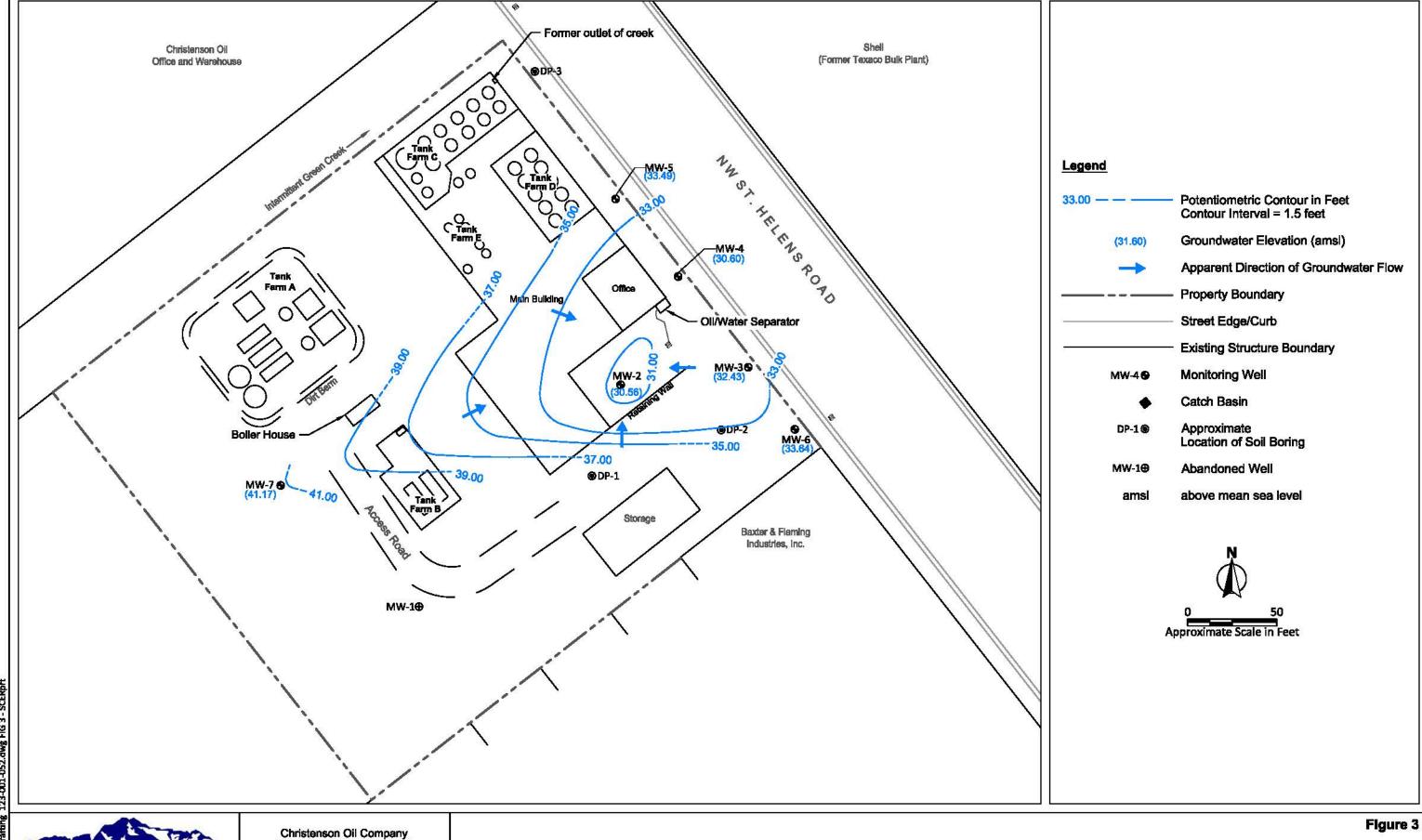


PACIFIC CREST ENVIRONMENTAL
WWW.PCENV.COM 425-888-4990

Christenson Oil Company 3821 N.W. St. Helens Road Portland, Oregon

PN: 123-001

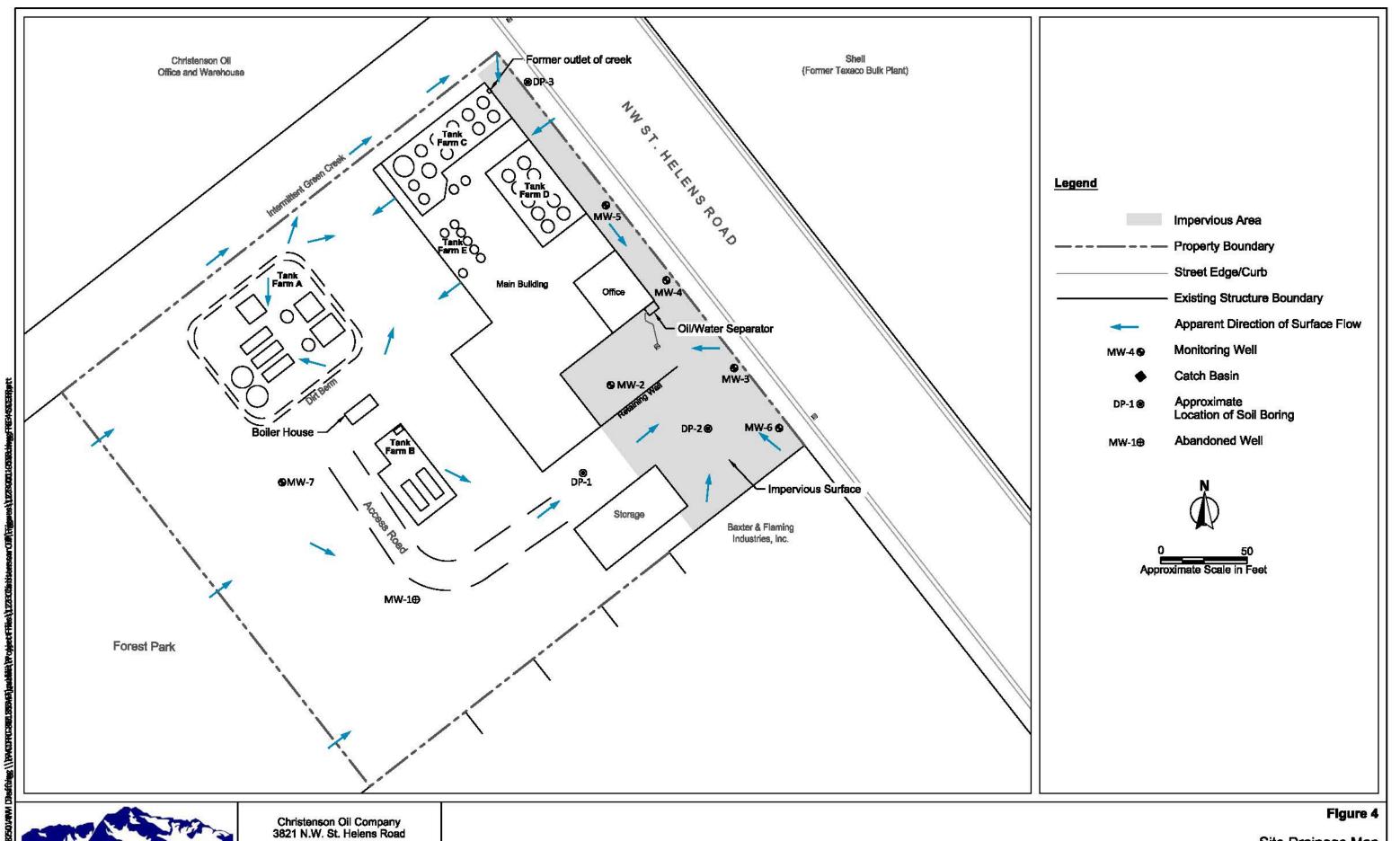
**Detailed Site Plan** 



PACIFIC CREST ENVIRONMENTAL
WWW.PCENV.COM 425-888-4990

Christenson Oil Company 3821 N.W. St. Helens Road Portland, Oregon

PN: 123-001



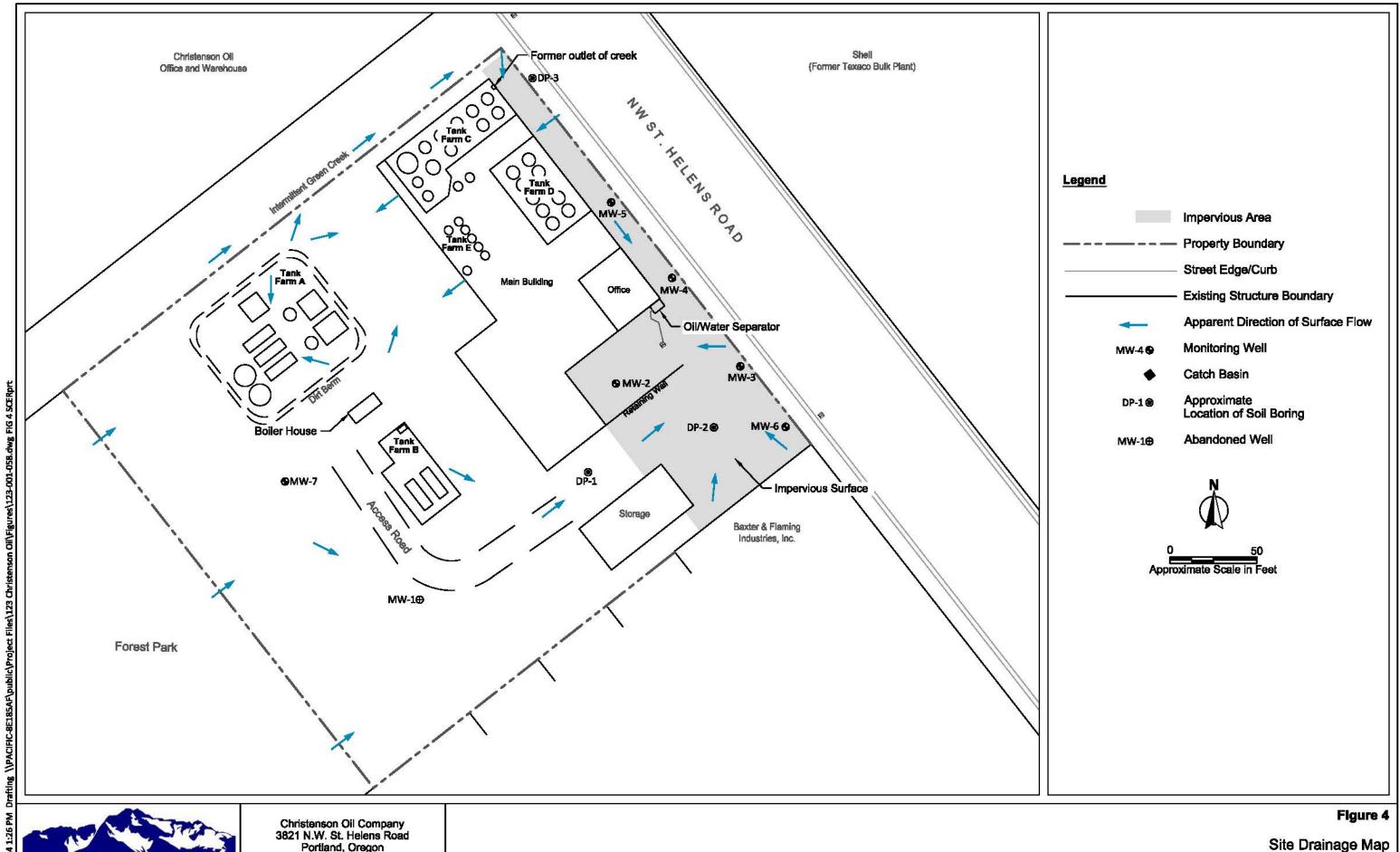
Portland, Oregon

PN: 123-001

PACIFIC CREST ENVIRONMENTAL

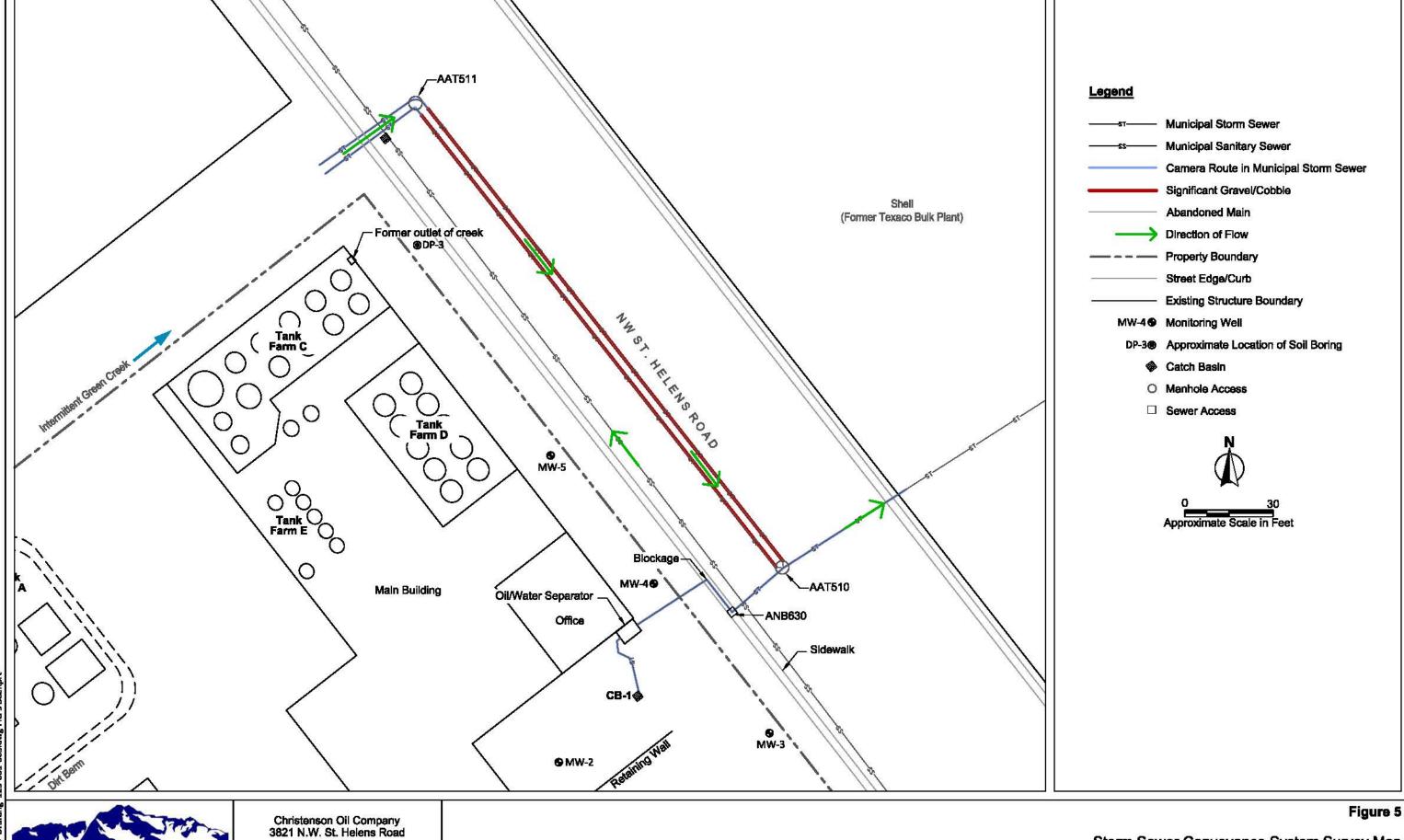
WWW.PCENV.COM 425-888-4990

Site Drainage Map



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PN: 123-001



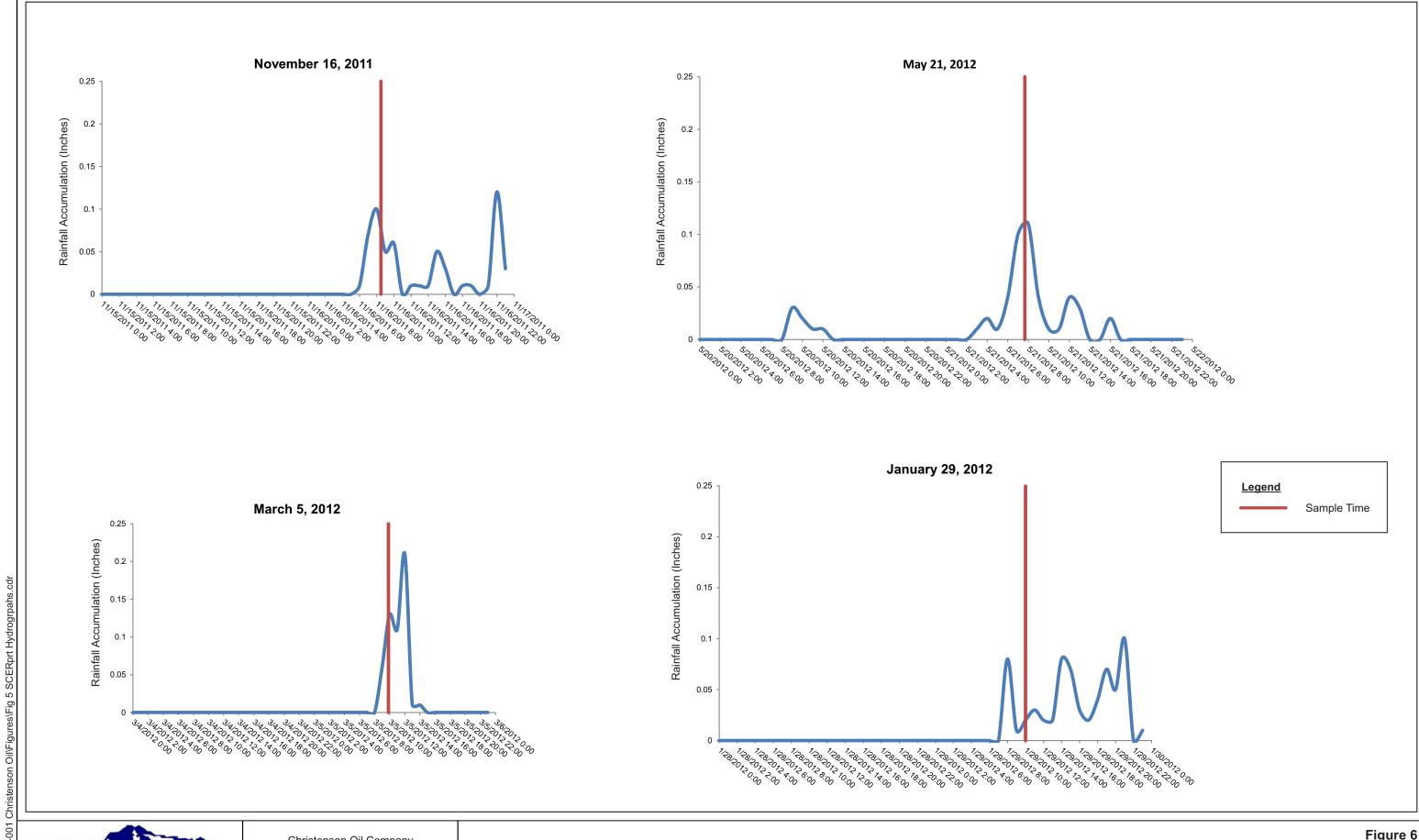
Portland, Oregon

PN: 123-001

PACIFIC CREST ENVIRONMENTAL

WWW.PCENV.COM 425-888-4990

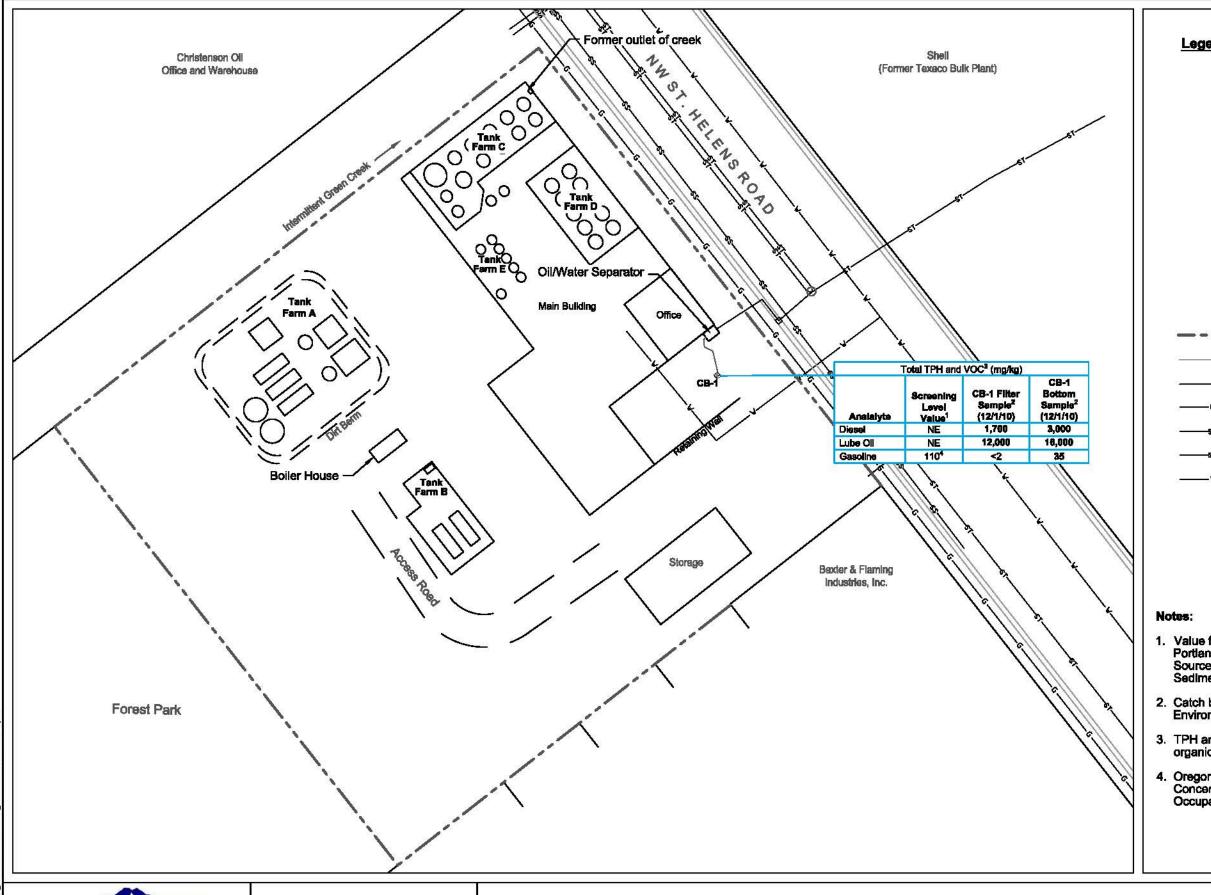
Storm Sewer Conveyance System Survey Map





Christenson Oil Company 3821 N.W. St. Helens Road Portland, Oregon

PN: 123-001



Legend

Catch Basin

CB-1 Catch Basin 1

SLV Screening Level Value

mg/kg milligrams per kilogram

NE not established

MDL Method Detection Limit

< Concentration was not detected at or above the laboratory MDL

BOLD Concentration detected above the laboratory MDL

TPH total petroleum hydrocarbons

**Property Boundary** 

Street Edge/Curb

**Existing Structure Boundary** 

Sanitary Sewer

Storm Sewer



Approximate Scale in Feet

- Value from Oregon Department of Environmental Quality:
   Portland Harbor Joint Source Control Strategy for Initial Upland Source Control Screening Evaluations for Soil and Stormwater Sedlment, December, 2005, unless otherwise noted.
- Catch basin sediment sample collected by Wohlers Environmental Services, Inc.
- 3. TPH analysis by Method NWTPH-Dx for diesel- and cil-range organics, and Method NWTPH-Gx for gasoline range organics.
- Oregon Department of Environmental Quality: Risk-Based Concentrations for Soil (Leaching to Groundwater) in an Occupational Setting, September 2009.

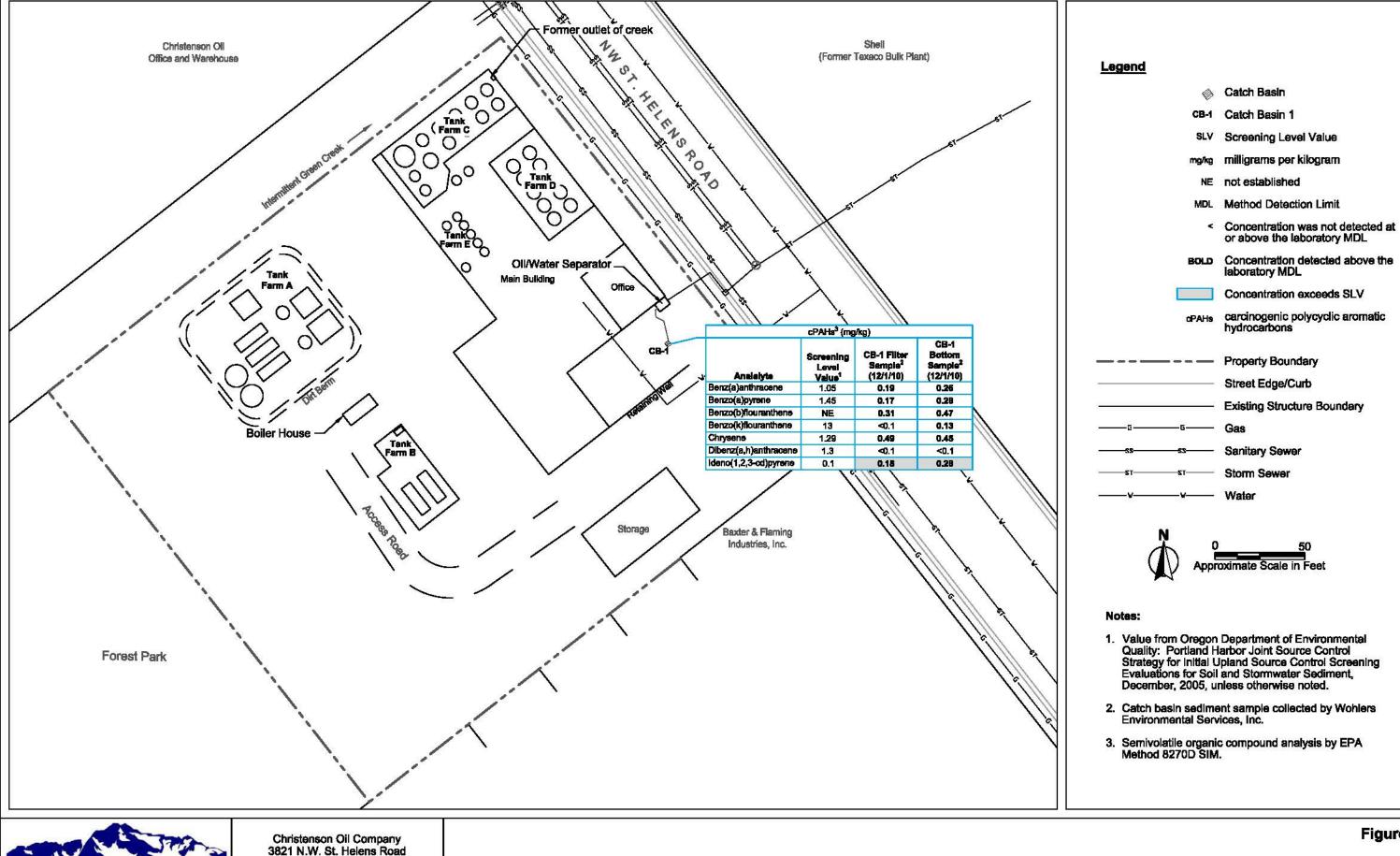
PACIFIC CREST ENVIRONMENTAL WWW.PCENV.COM 425-888-4990

Christenson Oil Company 3821 N.W. St. Helens Road Portland, Oregon

PN: 123-001

Figure 7

Catch Basin Analytical Results - TPH December 1, 2010



Portland, Oregon

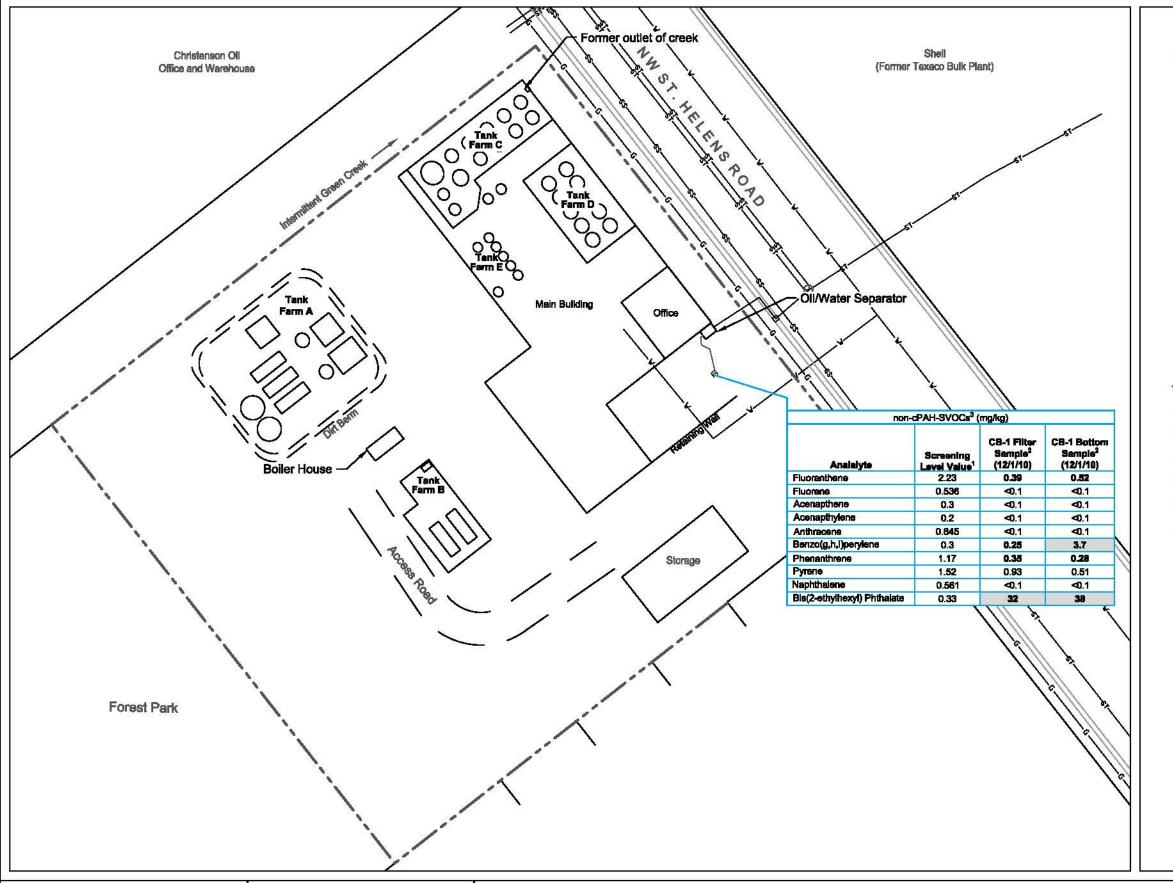
PN: 123-001

PACIFIC CREST ENVIRONMENTAL

WWW.PCENV.COM 425-888-4990

Figure 8

Catch Basin Analytical Results - cPAHs December 1, 2010



Legend

Catch Basin

CB-1 Catch Basin 1

SLV Screening Level Value

mg/kg milligrams per kilogram

NE not established

MDL Method Detection Limit

 Concentration was not detected at or above the laboratory MDL

BOLD Concentration detected above the laboratory MDL

Concentration exceeds SLV

non-cPAHs non-carcinogenic polycyclic aromatic hydrocarbons

svoc semivolatile organic compound

— — — Property Boundary

Street Edge/Curb

Existing Structure Boundary

— Gas

ss—ss—Sanitary Sewer

st---st------ Storm Sewer

—v——v— Water



O 50
Approximate Scale in Feet

### Notes:

- Value from Oregon Department of Environmental Quality: Portland Harbor Joint Source Control Strategy for Initial Upland Source Control Screening Evaluations for Soil and Stormwater Sediment, December, 2005, unless otherwise noted.
- Catch basin sediment sample collected by Wohlers Environmental Services, Inc.
- Semivolatile organic compound analysis by EPA Method 8270D SIM.

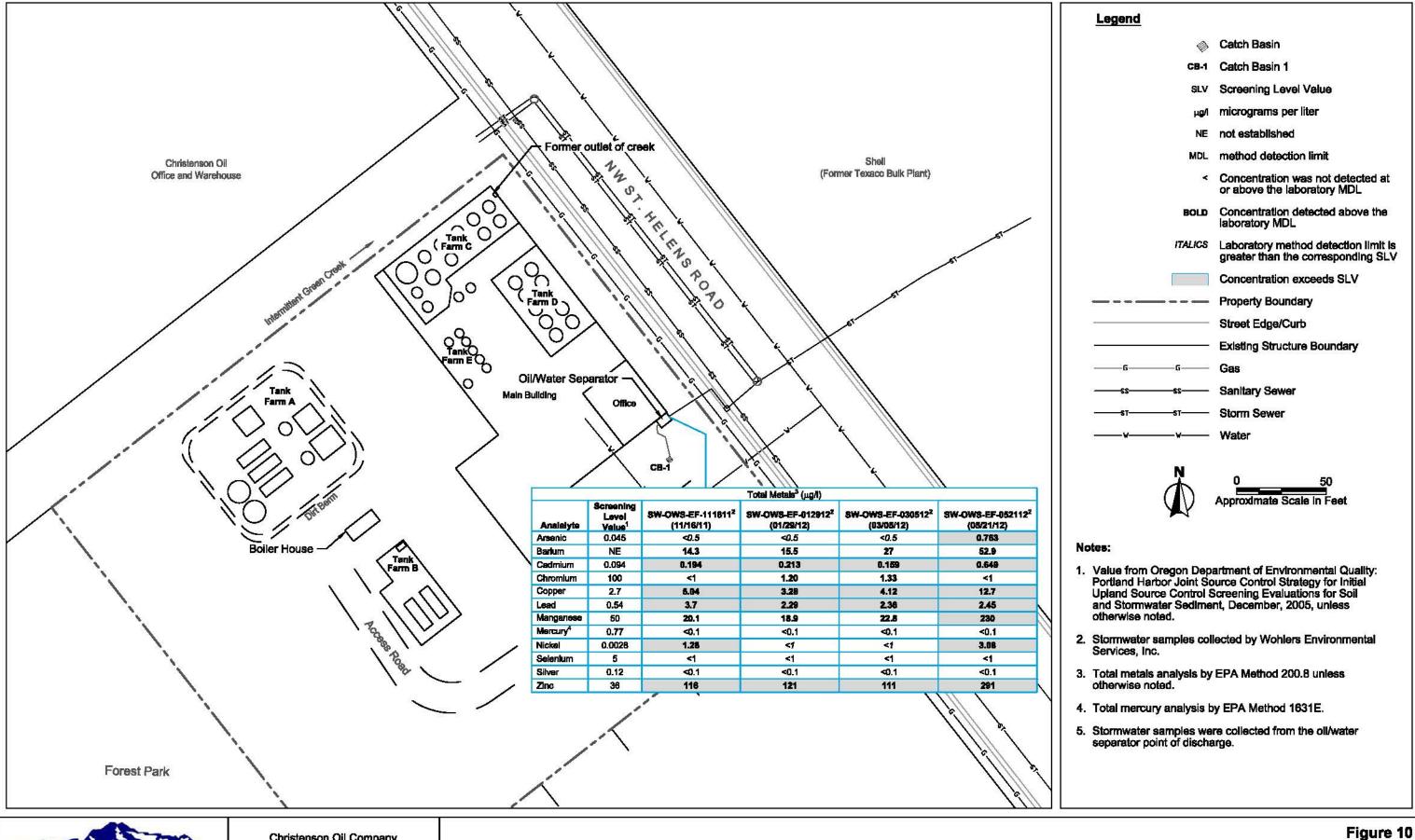


Christenson Oil Company 3821 N.W. St. Helens Road Portland, Oregon

PN: 123-001

Figure 9

Catch Basin Analytical Results - non-cPAH and SVOCs December 1, 2010



Stormwater Analytical Results - Total Metal

PN: 123-001

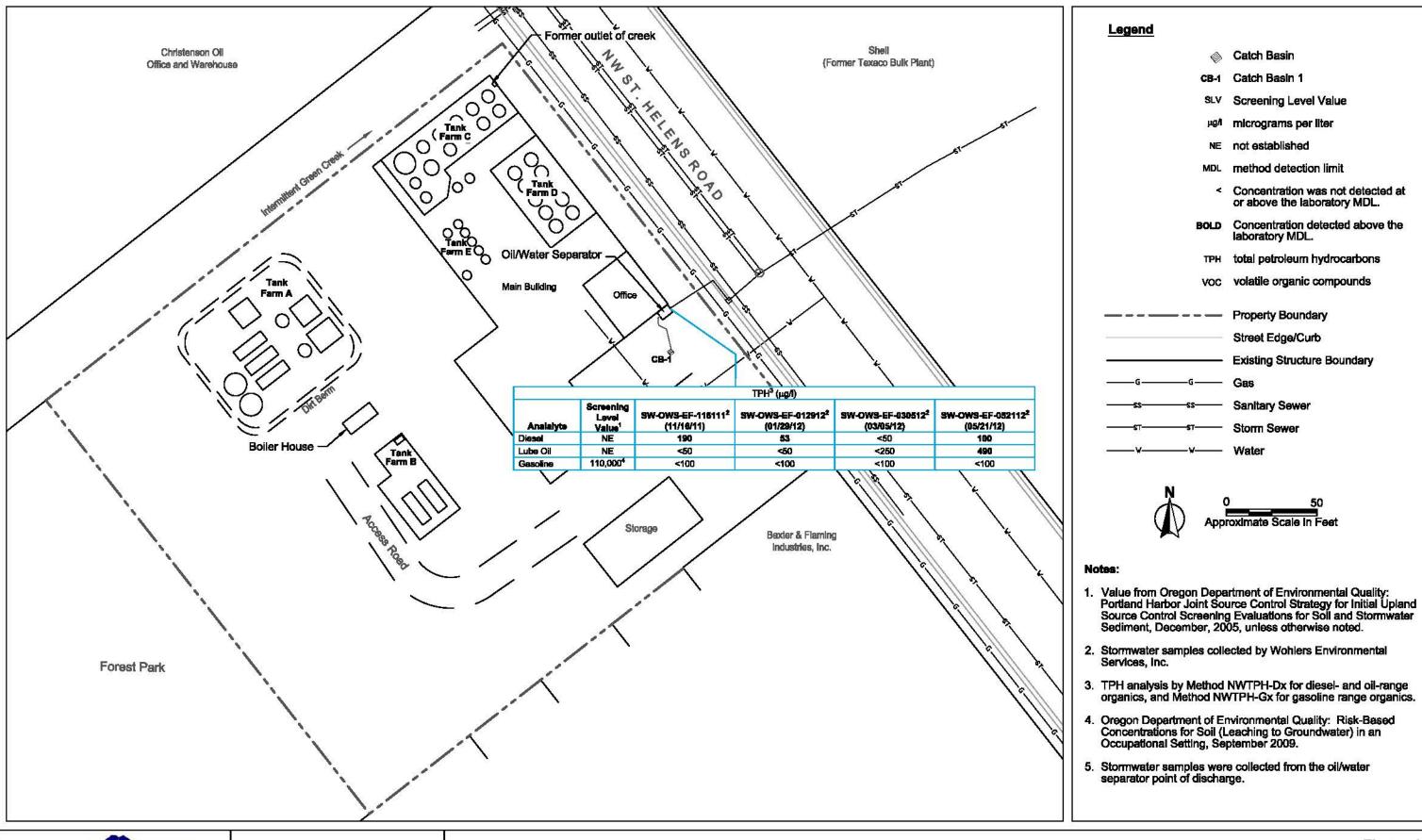


Figure 11

Stormwater Analytical Results - TPH

Catch Basin

SLV Screening Level Value μg/l micrograms per liter NE not established

> **Property Boundary** Street Edge/Curb

Sanitary Sewer

Approximate Scale In Feet

Storm Sewer

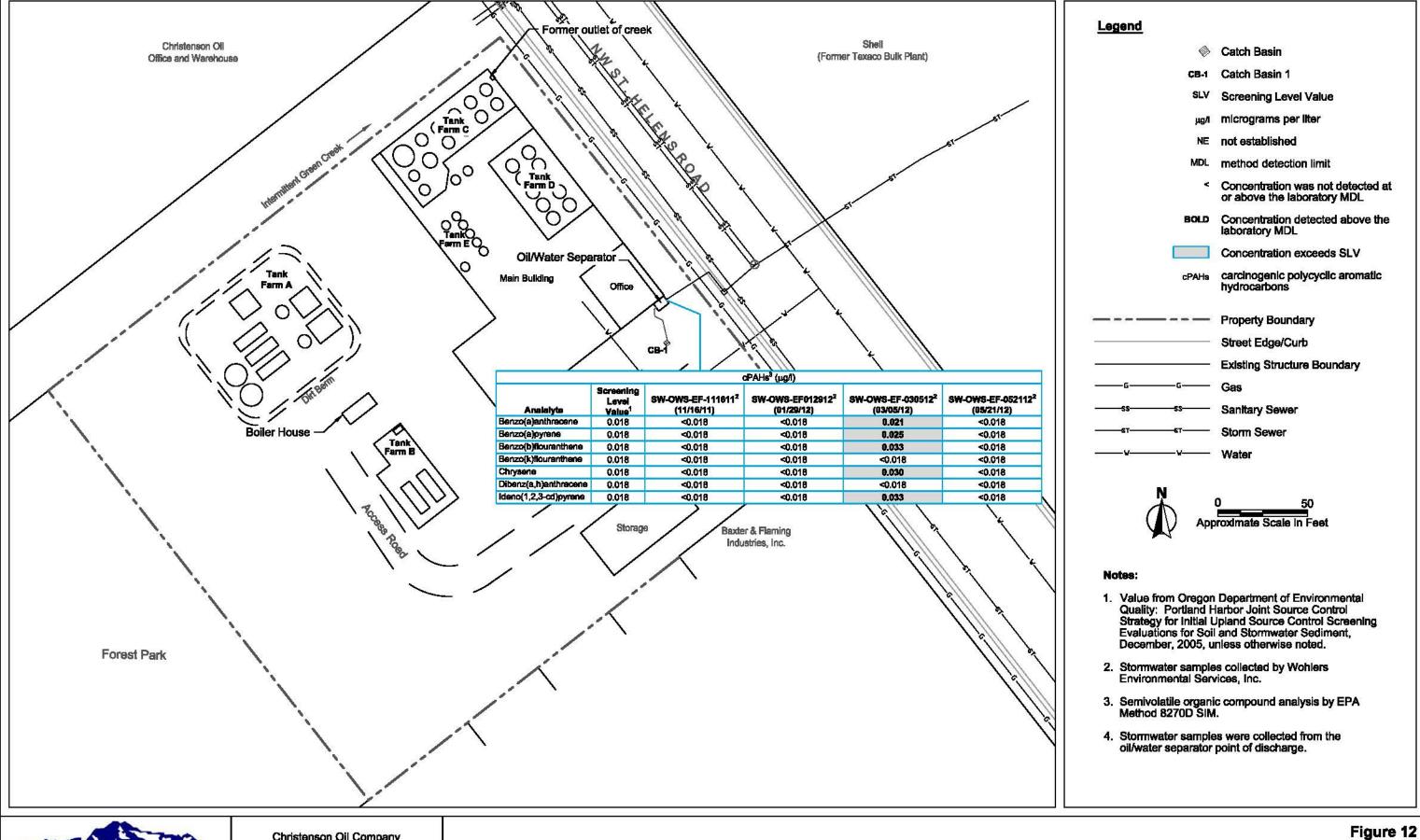
Water

**Existing Structure Boundary** 

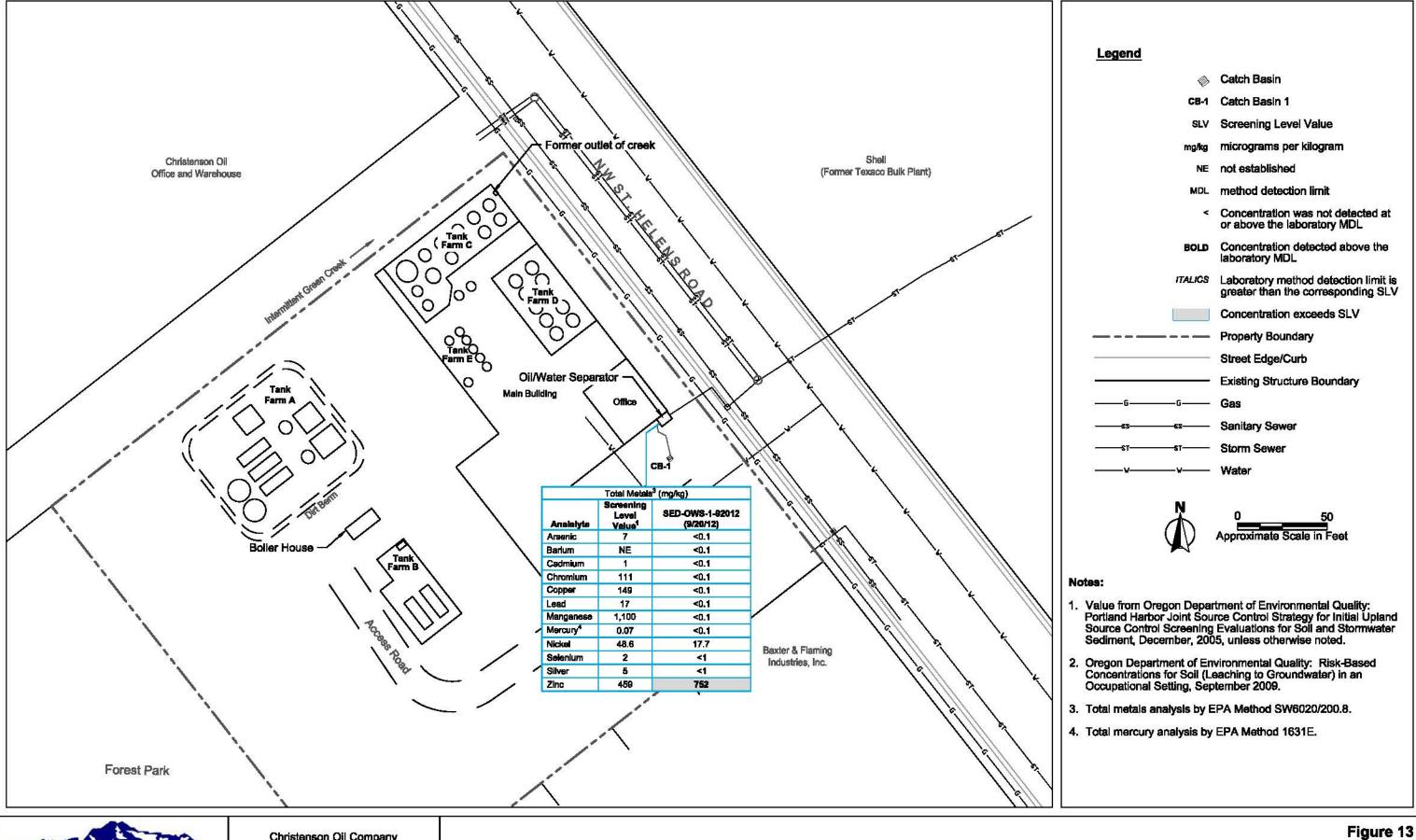
Concentration was not detected at or above the laboratory MDL.

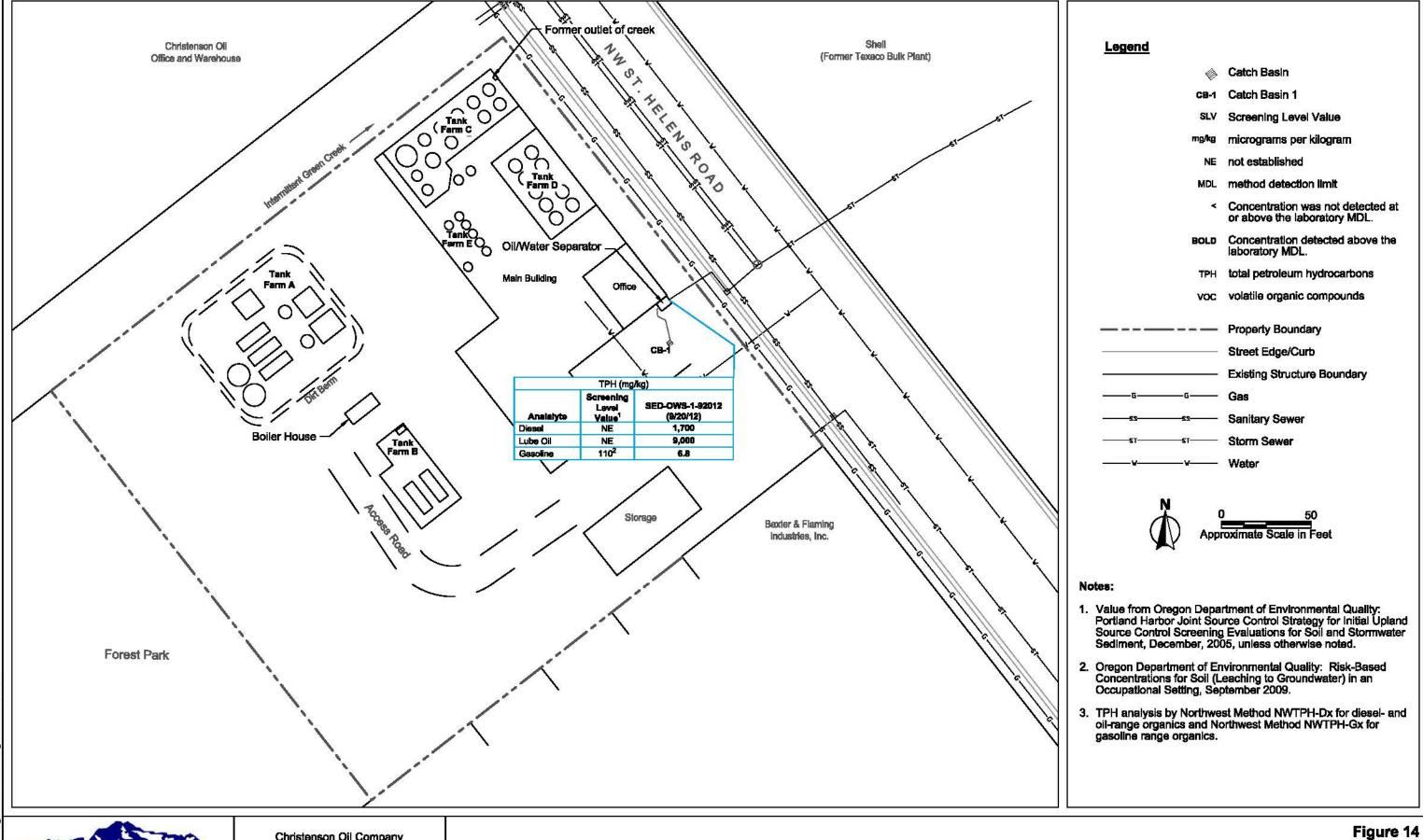
Christenson Oil Company 3821 N.W. St. Helens Road Portland, Oregon

PN: 123-001



Stormwater Analytical Results - cPAHs





Oil Water Separator Sediment Analytical Results - TPH

PN: 123-001

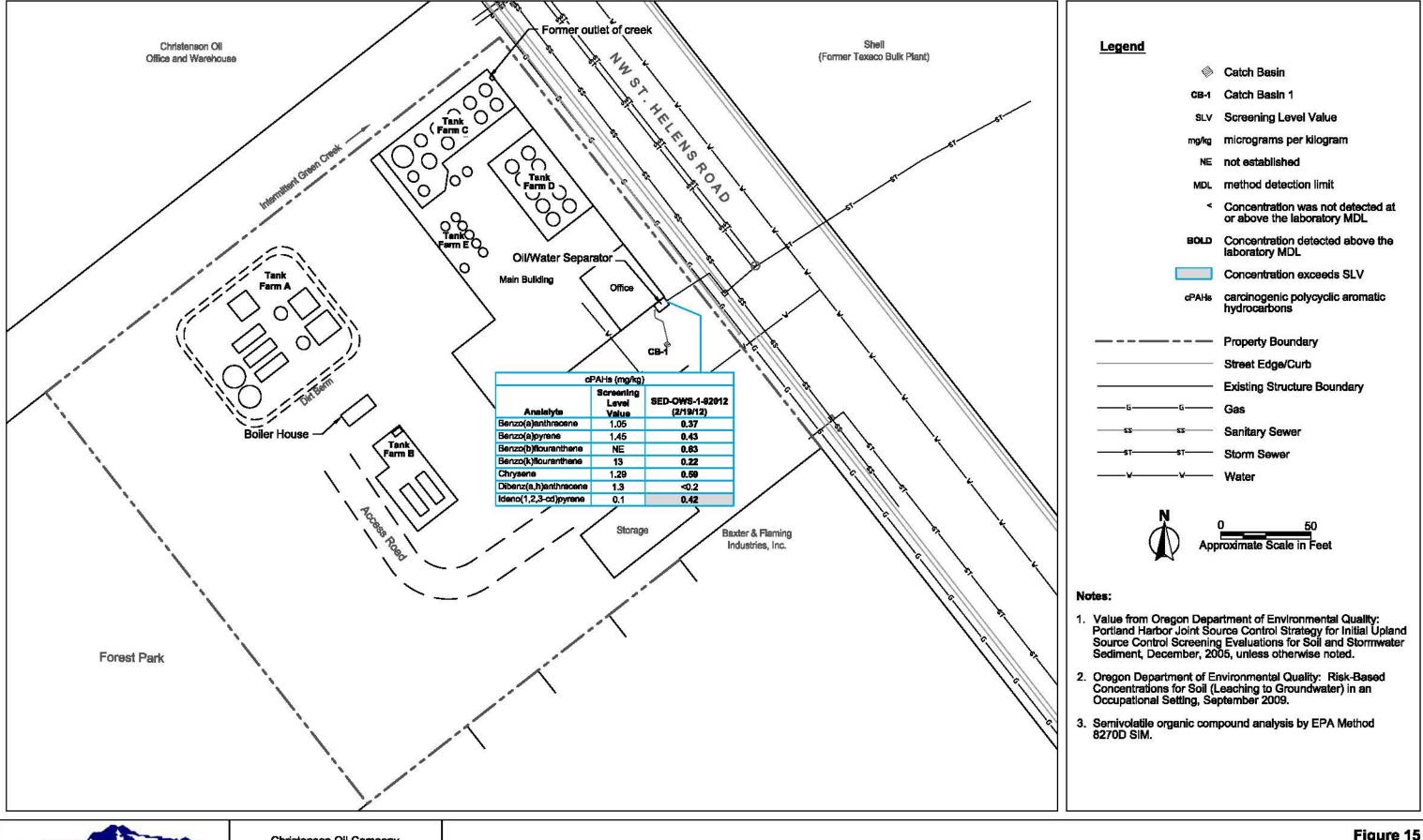


Figure 15

Oil Water Separator Sediment Analytical Results - cPAHs

PN: 123-001

### **TABLES**

SOURCE CONTROL EVALUATION REPORT CHRISTENSON OIL COMPANY PORTLAND, OREGON

> PACIFIC CREST NO. 123-001 ECSI NO. 2426

### Table 1 NPDES Stormwater Analytical Results Summary Christenson Oil 3821 NW St. Helens Rd, Portland, Oregon Pacific Crest PN 123-001

																											1		
												COC	S (µg/L)															1	
											E)								4										
Date	Sample Location <sup>1</sup>	Copper	Lead	Zinc	Cadmium	Nickel	Chromium	lron	Aldrin	ТОО	DDT Metabolite (DDE	Dieldrin	Total PCBs	Pentachlorophenol	Acenaphthene	Anthracene	Benz(a)anthracene	Benzo(a) pyrene	Benzo(b)fluoranthene 3,	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-cd)pyrene	Pyrene	рН	Total Suspended Solids (mg/L)	Oil and Grease (mg/L)
11/27/1996	Valve #1	2	<1	18.5	<1	5.4	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.82	<10	<0.500
10/30/1997	PLT 1 Dock Drain	28	35.7	368	1.7	5.3	8.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.39	108	1.03
9/18/1998	Plant 1	<20	<50	150	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<u> </u>	6.09	230	<3
11/20/1998	N/A	<30	<100	144	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.40	152	7.3
1/19/1999	Storm Drain Front Trucking Lot	<18	<45	90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.28	120	<3
3/1/1999	CB near Entrance & Loading Dock	56	<100	290	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<del>_</del>	6.70	246	14.7
5/17/1999	Plant #1 Truck Parking	<20	<50	70	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<u> </u>	6.15	19	<3
10/27/1999	CB near Entrance & Loading Dock	<30	<100	340	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<del>-</del>	6.60	98.8	23
6/27/2000	Stormwater/Truck Parking	52	90	900	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.72	760	7
11/29/2000	CB near Entrance & Loading Dock	<50	<200	170	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.00	55	<5
11/29/2000	Parking Lot Drain Pl#1	<50	16	150	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.52	97	<3
2/16/2001	Front Truck Parking Drain	<30	11	200	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.78	33	<3
11/19/2001	CB-1	28.9	419	392	-	-	-	-	-	-	-	-	-	-	<0.0500	0.07	0.18	0.62	0.59	0.16	0.2	0.12	0.34	0.13	0.59	0.95	6.38	402	-
11/20/2001	CB near Entrance & Loading Dock	162	<200	670	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.50	110	10
2/21/2002	Truck Dock/ Plant #1	<30	150	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		7.32	21	<3
5/13/2002	CB	35.6	<20	312	- 0.40	-	-	-	-	-	-	-	-	- 0.000	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05		6.59	20	-
12/23/2006	N/A	1.42	1.44	158	<0.10	0.93	<1.0	-	-	-	-	-	-	<0.029	<0.0031	<0.0039	<0.0039		<0.0046			<0.0036	0.011	<0.0036	0.0049		6.30	14	<5
3/7/2007 4/7/2007	N/A N/A	6.31 7.01	5.58 3.46	177 125	0.315 0.332	1.65 1.31	<b>1.76</b> <0.129	-	-	-	-	-	-	0.064 0.071	<0.0031 <b>0.0059</b>	<0.0039 <b>0.011</b>	0.013 0.0068	0.013 0.0072	0.023	<b>0.01</b> <0.0051	0.029 0.015	<b>0.0058</b> < 0.0036	0.032	<0.0036 <b>0.0059</b>	0.017 0.0087		5.86	22	- <5
6/9/2007	N/A N/A	9.62	4.73	98.6	0.332	1.36	1.09	-	-	-		-	-	0.071	<0.0039	<0.0036	0.0068	0.0072	0.0091	<0.0051		<0.0036	0.027	<0.0039	_		6.11	34	<5 <5
10/18/2007	Oil/Water Separator	<10	<b>4.73</b> <20	116	-	1.30	1.09	-	-	-	<u> </u>	-	-	0.14	<0.0044	<0.0036	-	-	-	<0.0025	0.0093	<0.0025	0.021	<0.0044	0.0059	0.018	6.11	34	<5 <5
11/19/2007	Oil/Water Separator	<10	<20	130	-	-	_	-	-	-	<u> </u>	-	-	-	-	-	-	-	-	-		-	-	<del>-</del>	-	<del>-</del>	5.25	13	<5 <5
12/2/2007	Oil/Water Separator	-	-	-	-	-	-	-	-	-		-	-	-	-	-		-	-	-		-	-	<u> </u>	-	<del>                                     </del>	5.78	-	-
1/2/2008	Oil/Water Separator	<10	<20	173	-	-	-	-	-	-		-	-	-	-	-		-	-	-	-	-		-	-	<del>                                     </del>	5.99	7	<5
3/28/2008	Oil/Water Separator	<10	<20	132	-	-	_	-	-	-	-	-	-	-	-	-	-	_	-	-	-	-	-	-	-	-	7.34	23	<5
11/5/2008	Oil/Water Separator	MW	MW	MW	-	-	_	-		_	_	-	-	-	_	-	-	-	-	-	-	-	-	-	-	-	6.20	MW	MW
11/20/2008	Oil/Water Separator	MW	MW	MW	-	-	-	-	-	-	-	-	_	-	-	-	-	-	-	-	-	-	-	-	-	<del>-</del>	5.60	MW	MW
	NPDES Benchmark <sup>2</sup>	100	400	600	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	5.5-9.0	130	10
10/22/2012	Oil/Water Separator	<10	<20	115	0.239	0.902	0.107	632	<0.009	<0.009	<0.009	<0.009	<0.008	<1.92	<0.048	<0.048	<0.048	<0.048	<0.048	<0.048	<0.048	<0.048	<0.048	<0.048	<0.048		6.50	<5.00	<3.30
11/11/2012	Oil/Water Separator	<10	<20	183	<1	<5	<5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	T -	7.33	12	<4.95
2/22/2013	Oil/Water Separator	<10	<20	217	<1	<5	9	3,220	<0.00496	<0.0125	<0.00496	<0.00496	<0.00992	<2.00	<0.051	<0.051	0.061	0.081	0.14	<0.051	0.071	<0.051	0.16	<0.051	0.1	0.19	6.40	76	7.58
4/19/2013	Oil/Water Separator	<10	<20	110	<1	<5	<5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.10	6	<5.10
	NPDES Benchmark <sup>3</sup>	20	40	120	N/A	N/A	N/A	1,000	3	1.1	0.01	2.5	2	20	95	2,900	1	1	1	1	1	1	14	390	1	1	5.5-9.0	100	10

Notes:
SLV = Screening Level Value
N/A = Not Available
NE= not established
-= Not Analyzed
μg/L = micrograms per liter
mg/l = milligrams per liter
MDL = Method Detection Limit

< = concentration was not detected at or above the laboratory MDL</li>
 Bold = concentration detected above the laboratory MDL
 = concentration exceeds NPDES benchmark

Stormwater sample collected by Wohlers Environmental Services, Inc.
 NPDES Benchmarks effective July 1, 2007
 NPDES Benchmarks effective July 1, 2012

123-001\_SCERpt\_Tbls 1 of 1

## Table 2 Outfall #18 Sediment Data Summary Christenson Oil

### 3821 NW St. Helens Rd, Portland, Oregon Pacific Crest PN 123-001

	1		1		1			1	1
Contaminant	Units	Down- Stream SD140	Down- Stream SD142	Nearest Outfall #18 SD143	Nearest Outfall #18 SD143-A	Up- Stream SD144	Up- Stream SD146	Up- Stream SD147	Apparent Portland Harbor Sediment Baseline Maximum Value
Aluminum	ppm	41,000	10,300	28,900	31,900	42,100	41,000	39,300	42,800
Antimony	ppm	<5	<6	<5	<5	6	<5	6	<5
Arsenic	ppm	<5	<6	<5	9	<6	<5	<5	<5
Barium	ppm	186	177	148	274	183	189	191	195
Beryllium	ppm	0.6	0.7	0.48	0.44	0.6	0.7	0.7	0.7
Cadmium	ppm	0.6	0.5	0.5	5.3	0.5	0.4	0.5	0.6
Chromium	ppm	37.6	37.9	32.1	157	39.3	37.8	36.8	41
Cobalt	ppm	19	18.1	14.8	17.6	18.5	19.2	19.5	19.7
Copper	ppm	44	47.9	34.1	124	48.3	43.9	44.5	60
Iron	ppm	43,400	43,000	34,500	36,500	44,700	42,900	42,800	45,000
Lead	ppm	15	17	28	1,080	20	14	15	30
Manganese	ppm	694	632	512	483	635	691	713	810
Mercury	ppm	0.08	0.06	0.04	0.37	0.06	0.05	0.06	0.1
Nickel	ppm	30	29	23.2	30.7	30	30	31	32
Selenium	ppm	10	14	10	8	11	14	12	15
Silver	ppm	0.7	0.8	0.6	3.4	0.8	0.7	0.7	1.4
Thallium	ppm	11	10	<5	<5	12	8	14	13
Titanium	ppm	-	2,010	1,840	1,870	2,160	1,900	1,900	2,075
Vanadium	ppm	106	108	86.3	91.9	110	105	105	112
Zinc	ppm	102	113	109	583	120	100	102	118
2-Methylnaphthalene	ppb	<20	<19	36	2,000	<19	<19	<19	150
4-Methylphenol	ppb	730	950	290	<910	1,200	750	990	680
Benzoic Acid	ppb	<200	<190	<190	<9,100	<190	<190	<190	<200
Benzyl Alcohol	ppb	<20	<19	<19	<910	<19	<19	<19	<20
bis(2-Ethylhexyl)phthalate	ppb	190	300	640	5,000	440	170	170	390
Butylbenzylphthalate	ppb	<20	<19	30	<910	20	<19	<19	<20
Carbazole	ppb	<20	<19	<19	<910	<19	<19	<19	100
Di-N-Butylphthalate	ppb	<20	<19	<19	<910	<19	<19	<19	<20
Di-N-Octylphthalate	ppb	<20	<19	<19	<910	<19	<19	<19	<20
Dibenzofuran	ppb	<20	21	<19	<910	<19	<19	<19	100
Dimethylphthalate	ppb	<20	<19	<19	<910	<19	<19	<19	<20
Pentachlorophenol	ppb	<99	<95	<96	<4,500	<96	<95	<95	Detect
Phenol	ppb	<20	<19	<19	<910	<19	<19	<19	<20
LPAHs (total)	ppb	62	228	157	1,100	58	32	25	700
HPAHs (total)	ppb	524	703	542	<910	501	232	254	2,400
Organotins (total)	ppb	-	17	<22.8	<1,080	9.8	<22.8	230	300
TOC	%	1.6	1.8	1	5.6	1.7	1.4	1.5	2
Water Depth	ft	18	35	16	17	37	35	31	-
Sediment Sample Depth	cm	0-17	0-17	0-15	0-104	0-17	0-17	0-17	-
Off Shore Distance	ft	240	300	215	215	150	195	150	-

### Notes:

ppm = parts per million

ppb = parts per billion

% = percentage

ft = feet

cm = centimeter

< = less than

The values presented on this table are from Table 2 of the DEQ Site Assessment Program - Strategy Recommendation, dated June 29, 2000.

### Table 3 **Pre-SCE Stormwater Analytical Results Summary: 2001 Christenson Oil**

### 3821 NW St. Helens Rd, Portland, Oregon Pacific Crest PN 123-001

PAHs¹ (μg/l)	CB-1 <sup>2</sup> (11/19/2001)
Naphthalene	0.27
2-Methylnaphthalene	-
Acenaphthylene	0.27
Acenaphthene	<0.0500
Fluorene	0.13
Phenanthrene	0.2
Anthracene	0.07
Fluoranthene	0.34
Pyrene	0.65
Benzo(a)anthracene	0.18
Chrysene	0.2
Benzo(b)fluoranthene	0.59
Benzo(k)fluoranthene	0.18
Benzo(a)pyrene	0.62
Indeno(1,2,3-cd)pyrene	0.59
Dibenz(a,h)anthracene	0.12
Benzo(g,h,i)perylene	1.02

### NOTES:

PAHs = polycyclic aromatic hydrocarbons

μg/l = micrograms per liter

MDL = Method Detection Limit

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<sup>&</sup>lt; = concentration was not detected at or above the laboratory MDL

<sup>&</sup>lt;sup>1</sup> Semivolatile organic compound analysis by EPA Method 8270D SIM. <sup>2</sup> Stormwater sample collected by Wohlers Environmental Services, Inc.

### Table 4 **Catch Basin Sample Location Summary Christenson Oil** 3821 NW St. Helens Rd, Portland, Oregon Pacific Crest PN 123-001

		Elevations (feet ams	sl¹)	Drainage	Date of last	Activities and Potential	Proposed for	If not sampled, rationale for sample
Stormwater System Component IDs	Grate	Top of Pipe/Culvert	IE of Structure	Subbasin	Cleanout	Sources Draining to the Catch Basin	Sampling?	location exclusion?
CB-1 (Receiving/Loading Area)	35.82	NM	33.32 <sup>2</sup>	Primary Subbasin	3/8/2010	Product transfer, minor leaks/spills, industrial debris	Yes (filter and bottom)	NA
CB-2 (Adjacent to East Property Corner in City ROW)	36.41	34.56	33.56	NA	NA	Stormwater runoff from NW St. Helens Road	No	Not considered to be directly in Site stormwater pathway
CB-3 (Adjacent to North Property Corner in City ROW)	38.40	36.80	35.80	NA	NA	Stormwater runoff from NW St. Helens Road	No	Not considered to be directly in Site stormwater pathway
Drain Grate (Covered Loading Dock)	40.18	NM	NM	Primary Subbasin	NA	NA	NA	NA
27" Culvert (Adjacent to North Property Corner)	NA	36.61	34.09	NA	NA	NA	NA	NA
24" Culvert (Adjacent to North Property Corner)	NA	37.09	34.39	NA	NA	NA	NA	NA
12" Pipe (Adjacent to North Property Corner Outlet for Intermittent Stream)	NA	36.61	35.53	NA	NA	NA	NA	NA
Grate (Adjacent to West Property Corner)	79.36 - high end 78.18 - low end	77.93	74.81	NA	NA	NA	NA	NA
36" Culvert (Adjacent to Northwest Corner of Building)	NA	43.46	40.38	NA	NA	NA	NA	NA
Oil/Water Separator 5" Inlet (Adjacent to East Corner of Building)	NA	34.50	NM	Primary Subbasin	NA	NA	NA	NA

NOTES: amsl = above mean sea level City ROW = City of Portland Right-of-Way

NM = not measured

IE = invert elevation

NA = not applicable

AST = aboveground storage tank

<sup>1</sup>Unless otherwise indicated, elevations are based on City of Portland benchmark BM 3319, and surveyed by Heritage Surveying of Portland, Oregon, on February 3, 2009.

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<sup>&</sup>lt;sup>2</sup>Base of 12-inch pipe in catch basin CB-1 measured by Wohlers Environmental Services, Inc.

# Table 5 SCE Sediment Analytical Results Summary Christenson Oil 3821 NW St. Helens Rd, Portland, Oregon Pacific Crest PN 123-001

		CB-1 Filter	CB-1 Bottom	Oil Water Separator						
		Sample <sup>2</sup>	Sample <sup>2</sup>	Sample <sup>2</sup>						
Analyte	SLV <sup>1</sup>	(12/1/10)	(12/1/10)	(9/20/12)						
	Total Petroleum Hyd	rocarbons <sup>3</sup> (mg/kg	g)	· ·						
Diesel	NE	1,700	3,000	1,700						
Oil	NE	12,000	16,000	9,000						
Gasoline	110 <sup>4</sup>	<2	35	6.8						
Semivolatile Organic Compounds⁵ (mg/kg)										
1,2-Dichlorobenzene	1.7	<1.5	<1.5	NA						
1,3-Dichlorobenzene	0.3	<1.5	<1.5	NA						
1,4-Dichlorobenzene	0.3	<1.5	<1.5	NA						
1,2,4-Trichlorobenzene	9.2	<1.5	<1.5	NA						
Hexachlorobenzene	0.019	<1.5	<1.5	NA						
2-Chloronaphthalene	NE	<1.5	<1.5	NA						
Hexachloroethane	16 <sup>4</sup>	<1.5	<1.5	NA						
Hexachlorobutadiene	0.6	<1.5	<1.5	NA						
Hexachlorocyclopentadiene	0.4	<4.5	<4.5	NA						
Bis-(2-chloroethoxy)methane	NE	<1.5	<1.5	NA						
Bis-(2-chloroethyl)ether	NE	<1.5	<1.5	NA						
4-chlorophenyl-phenyl ether	NE	<1.5	<1.5	NA						
4-bromophenyl-phenyl ether	NE	<1.5	<1.5	NA						
3,3'-Dichlorobenzidine	0.24	NA	NA	NA						
4-Chloroaniline	NE	<150	<150	NA						
Nitrobenzene	NE	<1.5	<1.5	NA						
Aniline	NE	NA	NA	NA						
2-Nitroanaline	NE	<1.5	<1.5	NA						
3-Nitroanaline	NE	<45	<45	NA						
4-Nitroanaline	NE	<45	<45	NA						
N-Nitrosodimethylamine	NE	NA	NA	NA						
N-Nitroso-di-n-propylamine	NE	<1.5	<1.5	NA						
n-Nitrosodiphenylamine	NE	<1.5	<1.5	NA						
2,4-Dinitrotoluene	NE	<1.5	<1.5	NA						
2,6-Dinitrotoluene	NE	<1.5	<1.5	NA						
Carbazole	1.6	<1.5	<1.5	NA						
Benzoic Acid	NE	<1.5	<1.5	NA						
Benzyl alcohol	NE	<1.5	<1.5	NA						
Dibenzofuran	NE	<1.5	<1.5	NA						
Isophorone	NE	<15	<15	NA						
Phenol	0.5	<15	<15	NA						
2-Methylphenol (o-Cresol)	NE	<15	<15	NA						
3-Methylphenol+4-Methylphenol	NE	<30	<30	NA						
2,4-Dimethylphenol	NE	<15	<15	NA						
2-Chlorophenol	NE	<15	<15	NA						

# Table 5 SCE Sediment Analytical Results Summary Christenson Oil 3821 NW St. Helens Rd, Portland, Oregon Pacific Crest PN 123-001

Analyte	SLV <sup>1</sup>	CB-1 Filter Sample <sup>2</sup> (12/1/10)	CB-1 Bottom Sample <sup>2</sup> (12/1/10)	Oil Water Separator Sample <sup>2</sup> (9/20/12)
2,4-Dichlorophenol	NE	<15	<15	(9/20/12) NA
2,4,5-Trichlorophenol	NE NE	<15	<15	NA NA
2,4,6-Trichlorophenol	13 <sup>4</sup>	<15	<15	NA NA
Pentachlorophenol	0.25	<15	<15	NA NA
4-Chloro-3methylphenol	NE	<15	<15	NA NA
2-Nitrophenol	NE NE	<15	<15	NA NA
4-Nitrophenol	NE NE	<15	<15	NA NA
2,4-Dinitrophenol	NE NE	<45	<45	NA NA
Methyl-4,6-Dinitrophenol 2-	NE NE	<45	<45	NA NA
Dimethyl phthalate	NE NE	<1.5	<1.5	NA NA
Diethyl phthalate	0.6	<1.5	<1.5	NA NA
Di-n-butyl phthalate	0.06	<1.5	<1.5	NA NA
Benz butyl phthalate	NE	<1.5	3.3	NA
Di-n-octyl phthalate	NE NE	<1.5	2	NA NA
Bis(2-ethylhexyl) phthalate	0.33	32	38	NA
Dio(2 ourymony), priumanato	Polycyclic Aromatic Hy			
2-Methylnaphthalene	0.2	<1.5	<1.5	NA
Naphthalene	0.561	<0.1	<0.1	<0.2
Acenaphthylene	0.301	<0.1	<0.1	<0.2
Acenaphthene	0.3	<0.1	<0.1	<0.2
Fluorene	0.536	<0.1	<0.1	<0.2
Phenanthrene	1.17	0.35	0.28	0.75
Anthracene	0.845	<0.1	<0.1	<0.2
Fluoranthene	2.23	0.39	0.52	1.1
Pyrene	1.52	0.93	0.51	1.1
Benzo(a)anthracene	1.05	0.19	0.26	0.37
Chrysene	1.29	0.49	0.45	0.59
Benzo(b)fluoranthene	NE	0.31	0.47	0.63
Benzo(k)fluoranthene	13	<0.1	0.13	0.22
Benzo(a)pyrene	1.45	0.17	0.28	0.43
Indeno(1,2,3-cd)pyrene	0.1	0.18	0.28	0.42
Dibenz(a,h)anthracene	1.3	<0.1	<0.1	<0.2
Benzo(g,h,i)perylene	0.3	0.25	0.37	0.43
	Polychlorinated Bi	phenyls <sup>7</sup> (mg/kg)		
Aroclor #1016	0.53	<0.1	<0.1	<0.1
Aroclor #1221	NE	<0.1	<0.1	<0.1
Aroclor #1232	NE	<0.1	<0.1	<0.1
Aroclor #1242	NE	<0.1	<0.1	<0.1
Aroclor #1248	1.5	<0.1	<0.1	<0.1
Aroclor #1254	0.3	<0.1	<0.1	<0.1
Aroclor #1260	0.2	<0.1	<0.1	<0.1

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### Table 5 SCE Sediment Analytical Results Summary Christenson Oil

### 3821 NW St. Helens Rd, Portland, Oregon Pacific Crest PN 123-001

		CB-1 Filter	CB-1 Bottom	Oil Water Separator
		Sample <sup>2</sup>	Sample <sup>2</sup>	Sample <sup>2</sup>
Analyte	SLV <sup>1</sup>	(12/1/10)	(12/1/10)	(9/20/12)
	Total Meta	als <sup>8</sup> (mg/kg)		
Arsenic	7	2.54	4.48	<0.1
Barium	NE	67.2	99.5	<0.1
Cadmium	1	1.56	2.87	<0.1
Chromium	111	36	70.3	<0.1
Copper	149	43.8	72.4	<0.1
Lead	17	50.2	84.6	<0.1
Manganese	1,100	179	243	<0.1
Mercury <sup>9</sup>	0.07	<0.2	<0.2	<0.1
Nickel	48.6	19.3	47.4	17.7
Selenium	2	<1	<1	<1
Silver	5	<1	<1	<1
Zinc	459	376	584	752
	Miscella	neous (%)		
Total Organic Carbon <sup>10</sup>	NE	5.8%	7.4%	13.8%
Total Solids <sup>11</sup>	NE	41.7%	42.6%	39.3%

### NOTES:

CB-1 = Catch Basin 1

SLV = Screening Level Value

NE= not established

NA = not analyzed

mg/kg = milligrams per kilogram

MDL = Method Detection Limit

< = concentration was not detected at or above the laboratory MDL

**Bold** = concentration detected above the laboratory MDL

ITALICS = laboratory method detection limit is greater than the corresponding SLV

= concentration exceeds SLV

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<sup>&</sup>lt;sup>1</sup>Value from Oregon Department of Environmental Quality: Portland Harbor Joint Source Control Strategy for Initial Upland Source Control Screening Evaluations for Soil and Stormwater Sediment, December, 2005, unless otherwise noted.

<sup>&</sup>lt;sup>2</sup>Sediment sample collected by Wohlers Environmental Services, Inc.

<sup>&</sup>lt;sup>3</sup>TPH analysis by Northwest Method NWTPH-Dx for diesel- and oil-range organics and Northwest Method NWTPH-Gx for gasoline range organics.

<sup>&</sup>lt;sup>4</sup>Oregon Department of Environmental Quality: Risk-Based Concentrations for Soil (Leaching to Groundwater) in an Occupational Setting, September 2009.

<sup>&</sup>lt;sup>5</sup>Semivolatile organic compound analysis by EPA Method 8270D.

<sup>&</sup>lt;sup>6</sup>Semivolatile organic compound analysis by EPA Method 8270D SIM.

<sup>&</sup>lt;sup>7</sup>Polychlorinated biphenyl analysis by EPA Method 8082A.

<sup>&</sup>lt;sup>8</sup>Total metals analysis by EPA Method 200.8 unless otherwise noted.

<sup>&</sup>lt;sup>9</sup>Total mercury analysis by EPA Method 1631E.

<sup>&</sup>lt;sup>10</sup>Total organic carbon analysis by SW-846 Method 9060.

<sup>&</sup>lt;sup>11</sup>Total solids analysis by Method SM 2540G.

### Table 6 SCE Stormwater Analytical Results Summary Christenson Oil 3821 NW St. Helens Rd, Portland, Oregon Pacific Crest PN 123-001

Analyte	SLV <sup>1</sup>	SW-OWS-EF-111611 <sup>2</sup> (11/16/11)	SW-OWS-EF-012912 <sup>2</sup> (01/29/12)	SW-OWS-EF-030512 <sup>2</sup> (03/05/12)	SW-OWS-EF-052112 <sup>2</sup> (05/21/12)
		Total Petroleum Hydro			
Diesel	NE <sup>4</sup>	190###	53###	<50	100###
Oil	NE <sup>4</sup>	<50	<250	<250	490
Gasoline	110,000 <sup>5</sup>	<100	<100	<100	<100
		Semivolatile Organic C			
1,2-Dichlorobenzene	49	<0.5	<0.5	<0.5	<0.5
1,3-Dichlorobenzene	14	<0.5	<0.5	<0.5	<0.5
1,4-Dichlorobenzene	2.8	<0.5	<0.5	<0.5	<0.5
1,2,4-Trichlorobenzene Hexachlorobenzene	8.2 0.00029	<0.5 <0.2	<0.5 <0.2*	<0.5 <0.2*	<0.5 <1*
2-Chloronaphthalene	490	<0.2	<0.2	<0.5	<0.5
Hexachloroethane	3.3	<0.5	<0.5	<0.5	<0.5
Hexachlorobutadiene	0.86	<0.5	<0.5	<0.5	<0.5
Hexachlorocyclopentadiene	5.2	<1.5	<1.5 <sup>#</sup>	<1.5	<1.5
Bis-(2-chloroethoxy)methane	NE	<0.5	<0.5	<0.5	<0.5
Bis-(2-chloroethyl)ether	0.06	<5*	<5	<5	<5
4-chlorophenyl-phenyl ether	0.06	<0.2	<0.2*	<0.2*	<0.2*
4-bromophenyl-phenyl ether	NE	<0.5	<0.5	<0.5	<0.5
3,3'-Dichlorobenzidine	0.028	<5	<2*#	<2*	<2*
4-Chloroaniline	150	<1.5	<1.5	<1.5	<1.5
Nitrobenzene	3.4	<0.5	<0.5	<0.5	<0.5
2-Nitroanaline	110	<0.5	<0.5	<0.5	<1.5
3-Nitroanaline	3.2	<1.5	<1.5	<1.5	<1.5
4-Nitroanaline	3.2	<5	<5	<5	<5
N-Nitrosodimethylamine	0.00042	<0.2#	<5 <sup>##</sup>	<5 <sup>#</sup>	<0.5
N-Nitroso-di-n-propylamine	0.0096	<5	<5	<5	<5
N-Nitrosodipenylamine	6	<0.5*#	<0.5	<0.5	<5##
2,4-Dinitrotoluene	3.4	<0.5	<0.5	<0.5	<0.5
2,6-Dinitrotoluene Carbazole	37 3.4	<0.1 <0.5	<0.1* <0.5	<0.1* <0.5	<0.1* <0.5
Benzoic Acid	42	<0.5 <15*	<0.5 <15*	<0.5 <15*	<0.5 <15*
Benzyl alcohol	8.6	<5	<5	<5	<5
Dibenzofuran	3.7	<0.5	<0.5	<0.5	<0.5
Isophorone	71	<0.5	<0.5	<0.5	<0.5
Phenol	2,560	<5	<5	<5	<5
2-Methylphenol (o-cresol)	13	<1*	<1*	<1*	<1*
4-Methylphenol (p-cresol)	180	<1	<1*	<1*	<1*
2,4-Dimethylphenol	730	<5	<5 <sup>#</sup>	<5	<5
2-Chlorophenol	30	<1*	<1*	<1*	<1*
2,4-Dichlorophenol	110	<1*	<1*	<1*	<1*
2,4,5-Trichlorophenol	3,600	<1	<1*	<1*	<1*
2,4,6-Trichlorophenol	2.4	<1	<1*	<1*	<1*
Pentachlorophenol	0.56	<1	<1*	<1*	<1*
4-Chloro-3methylphenol	NE	<1*	<1*	<1*	<1*
2-Nitrophenol	150	<1*	<1*	<1*	<1*
4-Nitrophenol	150	<1	<1*	<1*	<5
2,4-Dinitrophenol	73	<1	<1*	<1*	<15
Methyl-4,6-Dinitrophenol 2-	150	<1	<1*	<1*	<1*
Dimethyl phthalate	3	<0.5	<0.5	<0.5	0.76
Diethyl phthalate	3	<0.5	<0.5	0.53**	<0.5
Di-n-butyl phthalate Benz butyl phthalate	3	<0.5 <0.5	<0.5 <0.5	<0.5 <0.5	<0.5 <0.5
Benz butyl phthalate Di-n-octyl phthalate	3	<0.5 <0.5	<0.5 <0.5	<0.5 <0.5	<0.5 <0.5
Di-n-octyl pritnalate Bis(2-ethylhexyl) phthalate	2.2	<0.5 <5	<0.5 <5	<0.5 <5	<0.5 <5
Dio(2 etilyillexyi) piltilalate	2.2	Polycyclic Aromatic Hy			<b>~</b> 0
Naphthalene	0.2	<0.05	<0.05	<0.05	<0.05
Naphthalene 2-Methylnaphthalene	0.2	<0.05	<0.05	<0.05	<0.05
Acenaphthylene	0.2	<0.05	<0.05	<0.05	<0.05
Acenaphthene	0.2	<0.05	<0.05	<0.05	<0.05
Fluorene	0.2	<0.05****#	<0.05	<0.05	<0.05
Phenanthrene	0.2	<0.05	<0.05	<0.05	<0.05

## Table 6 SCE Stormwater Analytical Results Summary Christenson Oil 3821 NW St. Helens Rd, Portland, Oregon Pacific Crest PN 123-001

		SW-OWS-EF-111611 <sup>2</sup>	OW OWO 55 040040 <sup>2</sup>	SW-OWS-EF-030512 <sup>2</sup>	SW-OWS-EF-052112 <sup>2</sup>
Analyte	SLV <sup>1</sup>	(11/16/11)	SW-OWS-EF-012912 <sup>2</sup> (01/29/12)	(03/05/12)	(05/21/12)
Anthracene	0.2	<0.05	<0.05	<0.05	<0.05
Fluoranthene	0.2	<0.05	< 0.05	0.055	<0.05
Pyrene	0.2	<0.05	< 0.05	0.084	<0.05
Benzo(a)anthracene	0.018	<0.018	<0.018	0.021	<0.018
Chrysene	0.018	<0.018	<0.018	0.030#	<0.018
Benzo(b)fluoranthene	0.018	<0.018	<0.018	0.033	<0.018
Benzo(k)fluoranthene	0.018	<0.018	<0.018	<0.018	<0.018
Benzo(a)pyrene	0.018	<0.018	<0.018	0.025	<0.018
Indeno(1,2,3-cd)pyrene	0.018	<0.018	<0.018	0.033	<0.018
Dibenz(a,h)anthracene	0.018	<0.018	<0.018	<0.018	<0.018
Benzo(g,h,i)perylene	0.2	<0.05	< 0.05	< 0.05	<0.05
, <u>, , , , , , , , , , , , , , , , , , </u>	•	Polychlorinated Bip	ohenyls <sup>8</sup> (µg/l)		
Aroclor #1016	0.96	< 0.05	<0.05	<0.25	<0.025
Aroclor #1221	0.034	<0.05	< 0.05	<0.25	<0.025
Aroclor #1232	0.034	<0.05	< 0.05	<0.25	<0.025
Aroclor #1242	0.034	<0.05	<0.05	<0.25	<0.025
Aroclor #1248	0.034	<0.05	<0.05	<0.25	<0.025
Aroclor #1254	0.033	<0.05	<0.05	<0.25	<0.025
Aroclor #1260	0.034	<0.05	< 0.05	<0.25	<0.025
		Total Metals	<sup>9</sup> (μg/l)		
Arsenic	0.045	<0.5*	<0.5*	<0.5*	0.763*
Barium	NE	14.3	15.2	27	52.9
Cadmium	0.094	0.194*	0.213*	0.159*	0.649*
Chromium	100	<1	1.20	1.33	<1
Copper	2.7	5.04	3.28	4.12	12.7
Lead	0.54	3.70	2.29	2.36	2.45
Manganese	50	20.1	18.9	22.8	230
Mercury <sup>9</sup>	0.77	<0.1	<0.1	<0.1	<0.1
Nickel	0.0028	1.28	<1	<1	3.08
Selenium	5	<1	<1	<1	<1
Silver	0.12	<0.1*	<0.1*	-	<0.1*
Zinc	36	116	121	111	291
		Miscellaneou	s (mg/l)		
Total Organic Carbon <sup>11</sup>	NE	3.5	1.27	5.1	27
Total Suspended Solids <sup>12</sup>	NE	14	<10	<10	<25

#### NOTES:

SLV = Screening Level Value

NE= not established

NA = not analyzed

μg/l = micrograms per liter

mg/l = milligrams per liter

MDL = Method Detection Limit

< = concentration was not detected at or above the laboratory MDL

**Bold** = concentration detected above the laboratory MDL

ITALICS = laboratory method detection limit is greater than the corresponding SLV

= concentration exceeds SLV

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<sup>&</sup>lt;sup>1</sup> Value from Oregon Department of Environmental Quality: Portland Harbor Joint Source Control Strategy for Initial Upland Source Control Screening Evaluations for Water, December, 2005, unless otherwise noted.

 $<sup>^{2}\,\</sup>mathrm{Stormwater}$  sample collected by Wohlers Environmental Services, Inc.

<sup>&</sup>lt;sup>3</sup>TPH analysis by Northwest Method NWTPH-Dx for diesel- and oil-range organics and Northwest Method NWTPH-Gx for gasoline range organics.

<sup>&</sup>lt;sup>4</sup> Oregon Department of Environmental Quality: Risk Based Concentrations for Soil (Leaching to Groundwater) in an Occupational Setting, September 2009.

<sup>&</sup>lt;sup>5</sup>The constituent Risk Based Concentration for this pathway is greater than 100,000 mg/kg or 100,000 mg/L. DEQ believes it is highly unlikely that such concentrations will ever be encountered.

 $<sup>^{\</sup>rm 6}\,{\rm Semivolatile}$  organic compound analysis by EPA Method 8270D.

 $<sup>^{\</sup>rm 7}\,{\rm Semivolatile}$  organic compound analysis by EPA Method 8270D SIM.

<sup>&</sup>lt;sup>8</sup> Polychlorinated biphenyl analysis by EPA Method 8082A.

 $<sup>^{\</sup>rm 9}\,\text{Total}$  metals analysis by EPA Method 200.8 unless otherwise noted.

 $<sup>^{\</sup>rm 10}\,\text{Total}$  mercury analysis by EPA Method 1631E.

 $<sup>^{11}\</sup>mbox{Total}$  organic carbon analysis by EPA Method SM 5310B.

<sup>&</sup>lt;sup>12</sup>Total suspended solids analysis by EPA Method 2540D.

<sup>\*</sup> The result is below normal reporting limits. The value reported is an estimate.

<sup>\*\*</sup> The compound is a common laboratory and field contaminant.

<sup>\*\*\*</sup> The calibration results from this range fell outside of acceptance criteria. The value reported is an estimate.

<sup>#</sup> The analyte result in the laboratory control sample is out of control limits. The reported concentration should be considered an estimate.

<sup>##</sup> The reported concentration was generated from a library search.

<sup>\*\*\*\*</sup> The sample chromatographic pattern does not resemble the fuel standard used for quantitation.

# Table 7 Pre-SCE Sediment Analytical Data Summary: 2006 Christenson Oil 3821 NW St. Helens Rd, Portland Oregon

Pacific Crest PN 123-001

		00.4
	Applicable Target	CB-1
Anglista	Concentration <sup>1</sup>	Sample (10/24/2006) <sup>3</sup>
Analyte	ydrocarbons <sup>4</sup> (μg/kg)	(10/24/2006)
Diesel	NA NA	<25,000
Oil	NA NA	10,300,000
Gasoline	110,000 <sup>2</sup>	<20,000
	Compounds⁵ (µg/kg)	<20,000
1,1,1,-2 Tetrachloroethane	NA	<100
1,1,1-Trichloroethane (TCA)	NA NA	<100
1,1,2,3-Tetrachloroethane	NA	NA
1,1,2-Trichloroethane	25 <sup>2</sup>	<100
1,1-Dichloroethane	200 <sup>2</sup>	<100
1,2,3-Trichloropropane	NA	<200
1,2-Diclororethane (EDC)	NA	<100
Cis-1,2-Dichloroethylene	NA	<200
1,2-Dichloropropane	NA	<100
1,2-Dibromoethane (EDB)	NA	<100
2-Butane (MEK)	NA	<500
2-Hexanone	NA	<500
4-Methyl-2-Pentanone (MIBK)	NA	<500
Acetone	NA	<1,100
Acrylonitrile	1.7 <sup>2</sup>	NA
Bromochloromethane	NA	<100
Bromodichloromethane	13 <sup>2</sup>	<100
Bromoform	1,600 <sup>2</sup>	<100
Bromomethane	410 <sup>2</sup>	<200
Carbon Tetrachloride	73 <sup>2</sup>	<100
Chlorobenzene	27,000 <sup>2</sup>	<100
Chlorodibromomethane	110 <sup>2</sup>	<100
Chloroethane	1,400,000 <sup>2</sup>	<300
Chloroform	17 <sup>2</sup>	<100
Chloromethane	9,400 <sup>2</sup>	<100
Cis-1,3-dichloropropene	NA	<100
Dibromomethane	NA	<100
Dichlorodifluoromethane	NA	<200
Isopropylbenzene	NA	<100
Methylene chloride	NA	<700
Styrene	NA	<100
Trichlorofluoromethane	300,000 <sup>2</sup>	<200
Benzene	53 <sup>2</sup>	<30
Ethylbenzene	900 <sup>2</sup>	<100
m,p-Xylene	NA	NA
o-Xylene	NA	NA
Xylenes (total)	100,000 <sup>2</sup>	<100

# Table 7 Pre-SCE Sediment Analytical Data Summary: 2006 Christenson Oil 3821 NW St. Helens Rd, Portland Oregon

### Pacific Crest PN 123-001

		CB-1
	Applicable Target	Sample
Analyte	Concentration <sup>1</sup>	(10/24/2006) <sup>3</sup>
Methyl-tert-butyl ether	520 <sup>2</sup>	<200
Tetrachloroethene (PCE)	500	<100
Toluene	NA	1,200
p-Isopropyltoluene	NA NA	100
Trans-1,2-Dichloroethene	10,000 <sup>2</sup>	<100
Trans-1,3-Dichloropropene	NA	<100
Trichloroethene (TCE)	2,100	<100
	10 <sup>2</sup>	
Vinyl Chloride		<200
	с Compounds <sup>6</sup> (µg/k	9)
Halogenated Compounds	1.700	-167
1,2-Dichlorobenzene	1,700	<167
1,3-Dichlorobenzene	300	<167
1,4-Dichlorobenzene	300	<167 <167
1,2,4-Trichlorobenzene	9,200	
Hexachlorobenzene	19	<167
2-Chloronaphthalene	NA 16,000 <sup>2</sup>	<167
Hexachloroethane	·	<167
Hexachlorobutadiene	600	<167
Hexachlorocyclopentadiene	400	<167
Bis-(2-chloroethoxy)methane	NA	<167
Bis-(2-chloroethyl)ether	NA	<167
4-chlorophenyl-phenyl ether	NA	<167
4-bromophenyl-phenyl ether	NA 2	<167
3,3'-Dichlorobenzidine	200 <sup>2</sup>	<835
4-Chloroaniline	NA	<167
Organonitrogen Compounds		
Nitrobenzene	NA	<167
Aniline	NA	NA
2-Nitroanaline	NA	<167
3-Nitroanaline	NA	<167
4-Nitroanaline	NA	<167
N-Nitrosodimethylamine	NA	<167
N-Nitroso-di-n-propylamine	NA	<167
n-Nitrosodiphenylamine	NA	<167
2,4-Dinitrotoluene	NA	<167
2,6-Dinitrotoluene	NA	<167
Carbazole	1,600	560
Oxygen-Containing Compounds	,	
Benzoic Acid	NA	<3,340
Benzyl alcohol	NA	<167
Dibenzofuran	NA	183
Isophorone	NA	<167

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		CB-1
	Applicable Target	Sample
Analyte	Concentration <sup>1</sup>	(10/24/2006) <sup>3</sup>
Phenols and Substituted Phenols		
Phenol	50	330
2-Methylphenol (o-Cresol)	NA	<167
4-Methylphenol (p-cresol)	NA	4,540
2,4-Dimethylphenol	NA	<167
2-Chlorophenol	NA	<167
2,4-Dichlorophenol	NA	<167
2,4,5-Trichlorophenol	NA	<167
2,4,6-Trichlorophenol	13,000 <sup>2</sup>	<167
Pentachlorophenol	250	<250
4-Chloro-3methylphenol	NA	<167
2-Nitrophenol	NA	<835
4-Nitrophenol	NA	<835
2,4-Dinitrophenol	NA	<1670
Methyl-4,6-Dinitrophenol 2-	NA	<835
Phthalate Esters		
Dimethylphthalate	NA	<167
Diethylphthalate	600	<167
Di-n-butylphthalate	60	<167
Butylbenzylphthalate	NA	NA
Di-n-octylphthalate	NA	1,870
bis(2-ethylhexyl)phthalate	330	11,900
Polycyclic Aromatic Hydrocarbons		
Napthalene	561	<167
2-Methylnaphthalene	200	<167
Acenaphthylene	200	<167
Acenaphthene	300	398
Fluorene	536	313
Phenanthrene	1,170	3,750
Anthracene	845	792
Fluoranthene	2,230	4,560
Pyrene	1,520	3,870
Benzo(a)anthracene	1,050	1,690
Chrysene	1,290	1,820
Benzo(b)fluoranthene	NA	3,250
Benzo(k)fluoranthene	13,000	1,360
Benzo(a)pyrene	1,450	2,250
Indeno(1,2,3-cd)-pyrene	100	543
Dibenz(a,h)anthracene	1,300	353
Benzo(g,h,i)perylene	300	603

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Analyte	Applicable Target Concentration <sup>1</sup>	CB-1 Sample (10/24/2006) <sup>3</sup>
Arochlor #1016	Biphenyls <sup>7</sup> (µg/kg)	<10
Arochlor #1016 Arochlor #1221	NA	<10
Arochlor #1221 Arochlor #1232	NA NA	<10
Arochlor #1232 Arochlor #1242	NA NA	<10
Arochlor #1248	1,500	<10
Arochlor #1246 Arochlor #1254	300	<10
Arochlor #1260	200	20
	Pesticides <sup>8</sup> (µg/kg)	20
Aldrin	40	<67
α-BHC	NA	<67
	NA NA	<67
β-BHC δ-BHC	NA NA	<67
	4.99	<67
γ-BHC (Lindane) Chlorodane	0.37	<330
	0.37	<530 <67
p,p'-DDD	0.33	<67
p,p'-DDE	0.33	<67
p,p'-DDT Dieldrin	0.0081	<67
	0.0061 NA	<67
Endosulfan I(Thiodan) Endosulfan II	NA NA	<67
Endosulfan II Endosulfan Sulfate	NA NA	<67
	207	
Endrin		<67
Endrin aldehyde	NA NA	<67
Endrin ketone	NA 10	<67
Heptachlor	10	<67
Heptachlor epoxide	16	<67
Methoxychlor	NA NA	<130
Toxaphene	NA	<670

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## Table 7 Pre-SCE Sediment Analytical Data Summary: 2006

#### Christenson Oil

#### 3821 NW St. Helens Rd, Portland Oregon Pacific Crest PN 123-001

Analyte	Applicable Target Concentration <sup>1</sup> Metals <sup>9</sup> (µg/kg)	CB-1 Sample (10/24/2006) <sup>3</sup>
Antimony	64,000	<1,000
Arsenic	7,000	<1,000
Barium	NA NA	NA
Cadmium	1,000	<1,000
Chromium	111,000	7,000
Copper	149,000	73,000
Lead	17,000	44,000
Manganese	1,100,000	125,000
Mercury	70	<500
Nickel	48,600	6,000
Selenium	2,000	<1,000
Silver	5,000	<1,000
Zinc	459,000	444,000
Total Orga	nic Carbon <sup>10</sup> (μg/kg)	
Total Organic Carbon	NA	32,400,000

#### NOTES:

CB-1 = Catch Basin 1

NA= Not Available

μg/kg = micrograms per kilogram

< denotes concentration was not detected at or above the laboratory Method Reporting Limit.

**Bold** = denotes concentration detected above the laboratory Method Reporting Limit.

= concentration exceeds applicable

#### target concentration

<sup>1</sup>Value from Oregon Department of Environmental Quality: Portland Harbor Joint Source Control Strategy for Initial Upland Source Control Screening Evaluations for Soil and Stormwater Sediment, December, 2005, unless otherwise noted (see note 2).

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<sup>&</sup>lt;sup>2</sup> Oregon Department of Environmental Quality: Risk-Based Concentrations for Soil (Leaching to Groundwater) in an Occupational Setting, September 2009.

<sup>&</sup>lt;sup>3</sup> Catch Basin Sediment Sample collected by Wohlers Environmental Services, Inc.

<sup>&</sup>lt;sup>4</sup> TPH analysis by Method NWTPH-Dx for diesel- and oil-range organics, and Method NWTPH-Gx for gasoline range organics.

<sup>&</sup>lt;sup>5</sup> Volatile Organic Compound analysis by EPA Method 8260.

<sup>&</sup>lt;sup>6</sup> Semi-volatile organic compound analysis by EPA Method SW8270D.

<sup>&</sup>lt;sup>7</sup> Polychlorinated biphenyl analysis by EPA Method 8082.

<sup>&</sup>lt;sup>8</sup> Organochlorine pesticides analysis by EPA Method 8081A (GC-ECD).

<sup>&</sup>lt;sup>9</sup> Total metals analysis by EPA Method 200.8 ICP/MS.

<sup>&</sup>lt;sup>10</sup> Total organic carbon analysis by Method SW9060.

					SW-1	SW-2
	Applicable Target	OWS Sample	OWS Sample	OWS Sample	Creek Sample	Creek Sample
Analyte	Concentration <sup>1</sup>	(12/23/2006) <sup>3</sup>	(3/7/2007) <sup>3</sup>	(4/7/2007) <sup>3</sup>	(4/2/2010) <sup>3</sup>	(4/2/2010) <sup>3</sup>
			Hydrocarbons⁴ (µg/l)	( ,	(	(
Diesel	360 <sup>2</sup>	<250	<250	<250	<50	<50
Oil	1,100 <sup>2</sup>	<500	<500	<500	<250	<250
Gasoline	420 <sup>2</sup>	<40	<40	<250	<100	<100
			Compounds <sup>5</sup> (µg/l)	1200	1100	1100
1,1,1,-2 Tetrachloroethane	2.5	<2	<2	<2	<1	<1
1,1,1-Trichloroethane (TCA)	11	<2	<2	<2	<1	<1
1.1.2.3-Tetrachloroethane	0.33	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	1.2	<2	<2	<2	<1	<1
1.1-Dichloroethane	47	<2	<2	<2	<1	<1
1,2,3-Trichloropropane	0.0095	<3	<3	<3	<1	<1
1,2-Diclororethane (EDC)	0.73	<2	<2	<2	<1	<1
Cis-1,2-Dichloroethylene	61	<3	<3	<3	<1	<1
1,2-Dichloropropane	0.97	<2	<2	<2	<1	<1
1,2-Dibromoethane (EDB)	0.033	<2	<2	<2	<1	<1
2-Butane (MEK)	7,100	<8	<8	<8	<10	<10
2-Hexanone	99	<8	<8	<8	<10	<10
4-Methyl-2-Pentanone (MIBK)	170	<8	<8	<8	<10	<10
Acetone	1,500	<15	<15	<15	<10	11
Acrylonitrile	0.12	NA NA	NA NA	NA NA	NA NA	NA NA
Bromochloromethane	NA NA	<2	<2	<2	NA NA	NA NA
Bromodichloromethane	1.1	<2	<2	<2	<1	<1
Bromoform	8.5	<2	<2	<2	<1	<1
Bromomethane	8.7	<3	<3	<3	<1	<1
Carbon Disulfide	0.92	NA NA	NA NA	NA NA	NA NA	NA
Carbon Tetrachloride	0.51	<2	<2	<2	<1	<1
Chlorobenzene	50	<2	<2	<2	<1	<1
Chlorodibromomethane	0.79	NA NA	NA NA	NA NA	NA	NA
Chloroethane	23	<6	<6	<6	<1	<1
Chloroform	0.17	<2	<2	<2	<1	<1
Chloromethane	2.1	<2	<2	<2	<10	<10
Cis-1,2-Dichloroethylene	590	<3	<3	<3	<1	<1
Cis-1,3-dichloropropene	0.055	<2	<2	<2	<1	<1
Dibromomethane	61	<2	<2	<2	<1	<1
Dichlorodifluoromethane	390	<4	<4	<4	<1	<1
Isopropylbenzene	660	<2	<2	<2	<1	<1
Methylene chloride	8.9	<2	6**	7**	<5	<5
Styrene	100	<2	<2	<2	<1	<1
Trichlorofluoromethane	1,300	<3	<3	<3	<1	<1
Benzene	1.2	<0.3	<0.3	<0.3	<0.35	<0.35
Ethylbenzene	7.3	<1	<1	<1	<1	<1
m,p-Xylene	1.8	NA NA	NA NA	NA NA	<2	<2
o-Xylene	13	NA NA	NA NA	NA NA	<1	<1
Xylenes (total)	200	<1	<1	2	NA	NA NA
Methyltert-butyl ether	37	<4	<4	<4	<1	<1
Tetrachloroethene (PCE)	0.12	<2	<2	<2	<0.5	<0.5
Toluene	9.8	<1	<1	<1	<1	<1
Trans-1,2-Dichloroethene	110	<2	<2	<2	<1	<1
Trans-1,3-Dichloropropene	0.055	<2	<2	<2	<0.5	<0.5
Trichloroethene (TCE)	0.033	<2	<2	<2	<0.5	<0.5
Vinyl Chloride	0.015	<4	<4	<4	<0.2	<0.2

					SW-1	SW-2
	Applicable Target	OWS Sample	OWS Sample	OWS Sample	Creek Sample	Creek Sample
Analyte	Concentration <sup>1</sup>	(12/23/2006) <sup>3</sup>	$(3/7/2007)^3$	(4/7/2007) <sup>3</sup>	(4/2/2010) <sup>3</sup>	(4/2/2010) <sup>3</sup>
		Semivolatile Organ	nic Compounds <sup>6</sup> (μg/l	)		
Halogenated Compounds						
1,2-Dichlorobenzene	49	<0.2	<0.2	<0.2	<0.5	<0.5
1,3-Dichlorobenzene	14	<0.2	<0.2	<0.2	<0.5	<0.5
1,4-Dichlorobenzene	2.8	<0.2	<0.2	<0.2	<0.5	<0.5
1,2,4-Trichlorobenzene	8.2	<0.2	<0.2	<0.2	<0.5	<0.5
Hexachlorobenzene	0.00029	<0.2	<0.2	<0.2	<0.2*	<0.2*
2-Chloronaphthalene	490	<0.2	<0.2	<0.2	<0.5	<0.5
Hexachloroethane	3.3	<0.2	<0.2	<0.2	<0.5	<0.5
Hexachlorobutadiene	0.86	<0.2	<0.2	<0.2	<0.5	<0.5
Hexachlorocyclopentadiene	5.2	<0.96	< 0.96	<0.2	<1.5	<1.5
Bis-(2-chloroethoxy)methane	NA	<0.2	<0.2	<0.2	<0.5	<0.5
Bis-(2-chloroethyl)ether	0.06	<0.2	<0.2	<0.2	<0.5	<0.5
4-chlorophenyl-phenyl ether	0.06	<0.2	<0.2	<0.2	<0.2*	<0.2*
4-bromophenyl-phenyl ether	NA	<0.2	<0.2	<0.2	<0.5	<0.5
3,3'-Dichlorobenzidine	0.028	<2	<2	<2	<2	<2
4-Chloroaniline	150	<0.2	<0.2	<0.2	<1.5	<1.5
Organonitrogen Compounds						
Nitrobenzene	3.4	<0.2	<0.2	<0.2	<0.5	<0.5
Aniline	12	< 0.96	< 0.96	<0.96	NA	NA
2-Nitroanaline	110.0	<0.2	<0.2	<0.2	<0.5	<0.5
3-Nitroanaline	3.2	< 0.96	< 0.96	<0.96	<1.5	<1.5
4-Nitroanaline	3.2	<0.96	<0.96	<0.96	<5	<5
N-Nitrosodimethylamine	0.00042	<2	<2	<2	<0.2*	<0.2*
N-Nitroso-di-n-propylamine	0.0096	<0.2	<0.2	<0.2	<0.2	<0.2
n-Nitrosodiphenylamine	6	<0.2	<0.2	<0.2	<0.5	<0.5
2,4-Dinitrotoluene	3.4	<0.2	<0.2	<0.2	<0.5	<0.5
Carbazole	3.4	<0.2	0.015*	<0.2	<0.5	<0.5
Oxygen-Containing Compounds	•					
Benzoic Acid	42	2.6*	<4.8	<4.8	<15*	<15*
Benzyl alcohol	8.6	<4.8	<4.8	<4.8	<0.5	<0.5
Dibenzofuran	3.7	<0.2	<0.2	<0.2	<0.5	<0.5
Isophorone	71	<0.2	<0.2	<0.2	<0.5	<0.5
Phenols and Substituted Phenols					•	
Phenol	2,560	<0.48	<0.48	<0.48	<5	<5
2-Methylphenol (o-Cresol)	13	<0.48	<0.48	0.11*	<1	<1
4-Methylphenol (p-cresol)	180	<0.48	<0.48	0.16*	NA	NA
2,4-Dimethylphenol	730	<2	<2	<2	<1	<1
2-Chlorophenol	30	<0.48	<0.48	<0.48	<1	<1
2,4-Dichlorophenol	110	<0.48	<0.48	<0.48	<1*	<1*
2,4,5-Trichlorophenol	3,600	<0.48	<0.48	<0.48	<1*	<1*
2,4,6-Trichlorophenol	2.4	<0.48	<0.48	<0.48	<1*	<1*
2,3,4,6-Tetrachlorophenol	1,100	<1	<1	<1	<50	<50
Pentachlorophenol	0.56	<0.96	0.064*	0.071*	<1*	<1*
4-Chloro-3methylphenol	NA	<0.48	<0.48	<0.48	<1*	<1*
2-Nitrophenol	150	<0.48	<0.48	<0.48	<1	<1
4-Nitrophenol	150	<2	<2	<2	<1	<1
2,4-Dinitrophenol	73	<3.9	<3.9	<3.9	<1	<1
Methyl-4,6-Dinitrophenol 2-	150	<2	<2	<2	<1*	<1*

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					SW-1	SW-2
	Applicable Target	OWS Sample	OWS Sample	OWS Sample	Creek Sample	Creek Sample
Analyte	Concentration <sup>1</sup>	(12/23/2006) <sup>3</sup>	(3/7/2007) <sup>3</sup>	(4/7/2007) <sup>3</sup>	(4/2/2010) <sup>3</sup>	(4/2/2010) <sup>3</sup>
Phthalate Esters						
Dimethylphthalate	3	<0.2	0.35	0.2*	<0.5	<0.5
Diethylphthalate	3	0.06*	0.18*	0.23	<0.5	<0.5
Di-n-butylphthalate	3	0.084*	0.26	0.37	<0.5	<0.5
Butylbenzylphthalate	3	<0.2	0.41	0.47	<0.5	<0.5
Di-n-octylphthalate	3	<0.2	<0.2	<0.2	<0.5	<0.5
bis(2-Ethylhexyl)phthalate	2.2	1.4*	2.2	2.2	<5	<5
Polycyclic Aromatic Hydrocarbons						
Napthalene	0.2	0.027	0.0086*	0.021	< 0.05	< 0.05
2-Methylnaphthalene	0.2	<0.02	0.0085*	0.012*	NA	NA
Acenaphthylene	0.2	0.0028*	0.02	0.0047*	< 0.05	< 0.05
Acenaphthene	0.2	<0.02	<0.02	0.0059*	< 0.05	< 0.05
Fluorene	0.2	<0.02	<0.02	0.0084*	< 0.05	< 0.05
Phenanthrene	0.2	0.0077*	0.021	0.046	< 0.05	< 0.05
Anthracene	0.2	<0.02	<0.02	0.011*	< 0.05	< 0.05
Fluoranthene	0.2	0.011*	0.032	0.027	< 0.05	< 0.05
Pyrene	0.2	0.017*	0.059	0.032	< 0.05	< 0.05
Benzo(a)anthracene	0.018	<0.02	0.013*	0.0068*	<0.018	<0.018
Chrysene	0.018	0.0074*	0.029	0.015*	<0.018	<0.018
Benzo(b)fluoranthene	0.018	<0.02	0.023	0.01*	<0.018	<0.018
Benzo(k)fluoranthene	0.018	<0.02	0.01*	<0.02	<0.018	<0.018
Benzo(a)pyrene	0.018	0.0047*	0.013*	0.0072*	<0.018	<0.018
Indeno(1,2,3-cd)-pyrene	0.018	0.0049*	0.017*	0.0087*	<0.018	<0.018
Dibenz(a,h)anthracene	0.018	<0.02	0.0058*	<0.02	<0.018	<0.018
Benzo(g,h,i)perylene	0.2	0.0067*	0.025	0.012*	< 0.05	< 0.05
		Polychlorinated	d Biphenyls <sup>7</sup> (µg/l)			
Aroclor 1016	0.96	<0.00946	<0.101	1.4	<0.01	<0.01
Aroclor 1221	0.034	<0.00946	<0.101	<0.0221	<0.01	<0.01
Aroclor 1232	0.034	<0.00946	<0.101	<0.0221	<0.01	<0.01
Aroclor 1242	0.034	<0.00946	<0.101	<0.0221	<0.01	<0.01
Aroclor 1248	0.034	<0.00946	<0.101	<0.0221	<0.01	<0.01
Aroclor 1254	0.033	<0.00946	<0.101	<0.0221	<0.01	<0.01
Aroclor 1260	0.034	<0.00946	<0.101	<0.0221	<0.01	<0.01
Total PCBs	0.000064	-	-	-	-	-
PCB Congeners	NA	-	-	-	-	-
		Organochlorin	e Pesticides (µg/l)			
Aldrin	0.00005	-	-	-	-	-
α-BHC	0.0049	-	-	-	-	-
β-ВНС	0.017	=	-	-	-	-
δ-BHC	0.037	=	-	-	-	-
γ-BHC (Lindane)	0.052	=	-	-	-	-
Chlorodane	0.00081	=	-	-	-	-
p,p'-DDD	0.00031	-	-	-	-	-
p,p'-DDE	0.00022	=	-	-	-	-
p,p'-DDT	0.00022	=	=	-	=	-
Dieldrin	0.000054	-	-	-	-	-
Endosulfan I(Thiodan)	0.051	=	-	-	-	-
Endosulfan II	0.051	-	-	-	-	-
Endosulfan Sulfate	89	=	-	-	-	-
Endrin	0.036	=	-	-	-	-
Endrin aldehyde	NA	-	-	-	-	-
Endrin ketone	NA	=	-	-	-	-
Heptachlor	0.000079	-	-	-	-	-
Heptachlor epoxide	0.000039	=	-	-	-	-
Methoxychlor	0.03	=	-	-	-	-
Toxaphene	0.0002	-	-	-	-	-

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					SW-1	SW-2
	Applicable Target	OWS Sample	OWS Sample	OWS Sample	Creek Sample	Creek Sample
Analyte	Concentration <sup>1</sup>	(12/23/2006) <sup>3</sup>	$(3/7/2007)^3$	$(4/7/2007)^3$	(4/2/2010) <sup>3</sup>	(4/2/2010) <sup>3</sup>
		Total Me	etals <sup>8</sup> (µg/l)			
Antimony	6	<0.5	<0.5	<0.099	-	-
Arsenic	0.045	<1	<1	<0.028	0.673	0.548
Barium	29,000 <sup>2</sup>	=	-	-	41.7	34.5
Cadmium	0.094	<0.1	0.315	0.332	0.195	<0.1
Chromium	100	<1	1.76	<0.129	4.44	3.07
Copper	2.7	1.42	6.31	7.01	3.46	2.58
Lead	0.54	1.44	5.58	3.46	1.87	1.72
Manganese	50	342	257	42.4	61.6	57.5
Mercury	0.77	< 0.05	< 0.05	< 0.004	<0.1	<0.1
Nickel	16	0.93	1.65	1.31	3.07	1.9
Selenium	5	<1	<1	< 0.0250	<1	<1
Silver	0.12	<0.1	<0.1	< 0.016	<0.1	<0.1
Zinc	36	158	177	125	9.72	12.3
		Misce	llaneous			
pH <sup>9</sup>	5.5 - 9.0 <sup>13</sup>	6.3	-	5.86	-	-
Polar/non-Polar Oil and Grease <sup>10</sup> (µg/l)	10,000 <sup>13</sup>	<5,000	-	<5,000	-	-
Total Suspended Solids <sup>11</sup> (µg/l)	130,000 <sup>13</sup>	14,000	-	22,000	77,000	77,000
Total Organic Carbon <sup>12</sup> (μg/l)	-	=	-	-	2,700	2,780

#### NOTES:

NA= Not Available

OWS = Oil/Water Separator

SW = Surface Water

 $\mu$ g/I = micrograms per liter

- = compound not analyzed
- < =concentration was not detected at or above the indicated laboratory Method Reporting Limit.</p>
- \* = a value flagged by the laboratory as an estimated concentration that is less than the method reporting limit but greater than or equal to the method detection limit
- \*\* = a value flagged by the laboratory as a concentration likely due to the analytical instrument

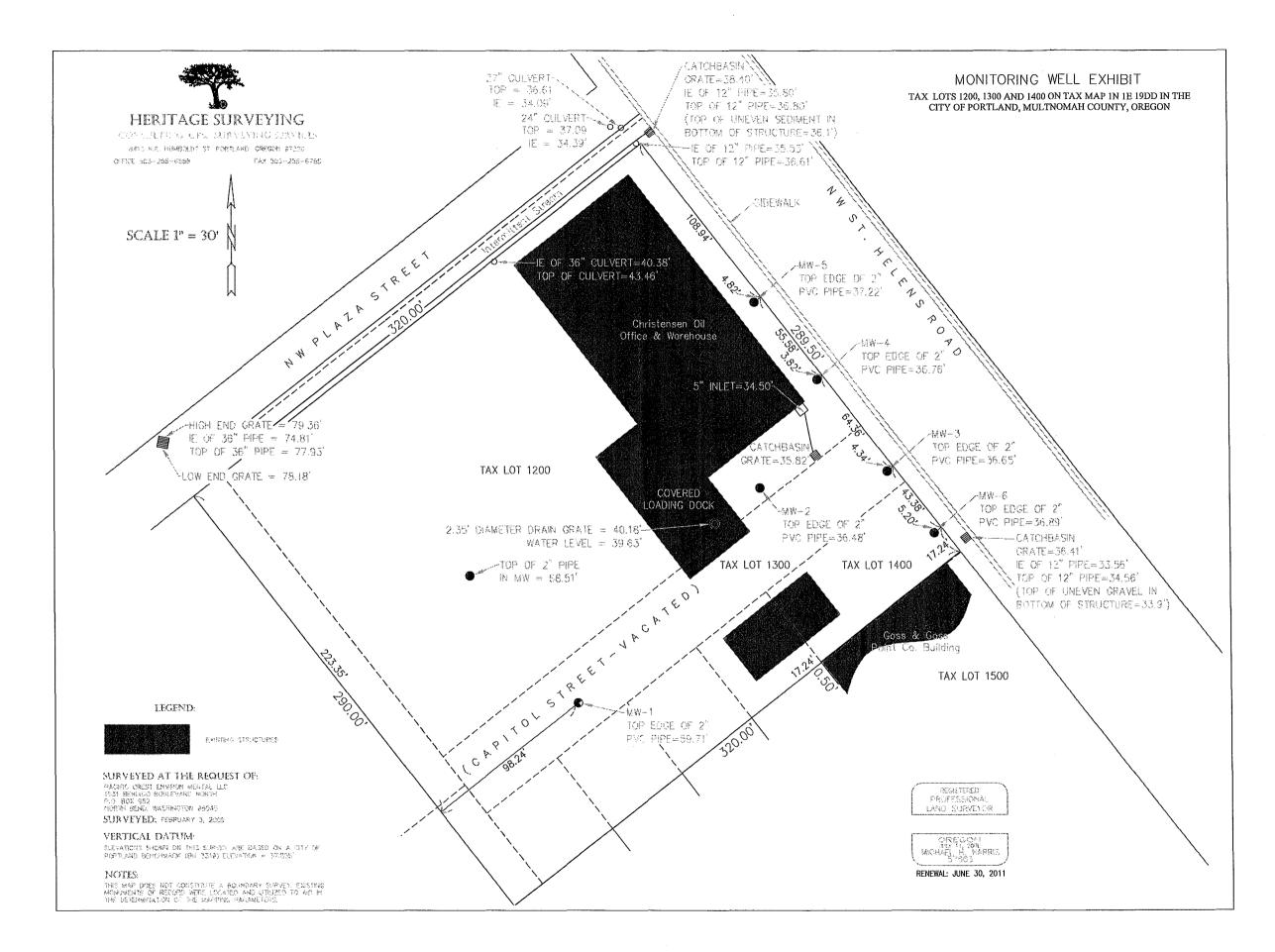
**Bold** = the concentration was detected at or above the laboratory Method Reporting Limit.

- = denotes concentration exceeds applicable target concentration
- <sup>1</sup> Value from Oregon Department of Environmental Quality: Portland Harbor Joint Source Control Strategy for Initial Upland Source Control Screening Evaluations for Soil and Stormwater Sediment, December, 2005, unless otherwise noted (see Note #2)
- <sup>2</sup> Oregon Department of Environmental Quality: Risk-Based Concentrations for Soil (Leaching to Groundwater) in an Occupational Setting, September 2009.
- <sup>3</sup> Stormwater samples collected by Wohlers Environmental Services, Inc. on the Christenson Oil property.
- <sup>4</sup> TPH analysis by Method NWTPH-Dx for diesel- and oil-range organics, and Method NWTPH-Gx for gasoline range organics.
- <sup>5</sup> Volatile organic compound analysis by EPA Method 8260B/C.
- <sup>6</sup> Semi-volatile organic compound analysis by EPA Method SW8270C/D.
- $^{\rm 7}$  Polychlorinated biphenyl analysis by EPA Method E8082.
- <sup>8</sup> Total metals analysis by EPA Method SW6020/200.8.
- <sup>9</sup> pH analysis by Method E150.1.
- <sup>10</sup> Oil and grease analysis by Method E1664.
- <sup>11</sup> Total suspended solids analysis by Method E160.2/2540D.
- <sup>12</sup> Total organic carbon analysis by EPA Method 415.1.
- <sup>13</sup> Source: National Pollutant Discharge Elimination System Storm Water Discharge Permit 1200-Z benchmark values.

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## APPENDIX A HERITAGE SURVEY MAP

SOURCE CONTROL EVALUATION REPORT CHRISTENSON OIL COMPANY PORTLAND, OREGON



## APPENDIX B STORM SEWER CONVEYANCE SYSTEM VIDEO

SOURCE CONTROL EVALUATION REPORT CHRISTENSON OIL COMPANY PORTLAND, OREGON

## APPENDIX C TANK FARM SUMMARY

SOURCE CONTROL EVALUATION REPORT CHRISTENSON OIL COMPANY PORTLAND, OREGON

#### Table 2-1 (Page 1 of 6)

#### **SUMMARY OF OIL CONTAINERS – EAST PLANT**

#### CHRISTENSON OIL COMPANY 3821-3865 N.W. ST. HELENS ROAD PORTLAND, OREGON

ID	STORAGE CAPACITY (gallons)	CONTAINER CONTENTS	CONTAINER DESCRIPTION	DISCHARGE PREVENTION & CONTAINMENT
TANK	FARM A (Exterior)		<u> </u>	
1	20,000	Base Oil	Horizontal AST	Earthen Secondary Containment Unit
2	20,000	Base Oil	Horizontal AST	Earthen Secondary Containment Unit
3	20,000	Base Oil	Horizontal AST	Earthen Secondary Containment Unit
5	15,000	Base Oil	Horizontal AST	Earthen Secondary Containment Unit
6	10,000	Base Oil	Horizontal AST	Earthen Secondary Containment Unit
7	8,000	Base Oil	Horizontal AST	Earthen Secondary Containment Unit
8	8,400	Base Oil	Vertical AST	Earthen Secondary Containment Unit
9	12,000	Base Oil	Vertical AST	Earthen Secondary Containment Unit
10	30,000	Base Oil	Vertical AST	Earthen Secondary Containment Unit
11	20,000	Base Oil	Vertical AST	Earthen Secondary Containment Unit

#### Table 2-1 (*Page 2 of 6*)

#### **SUMMARY OF OIL CONTAINERS – EAST PLANT**

#### CHRISTENSON OIL COMPANY 3821-3865 N.W. ST. HELENS ROAD PORTLAND, OREGON

ID	STORAGE CAPACITY	CONTAINER CONTENTS	CONTAINER DESCRIPTION	DISCHARGE PREVENTION & CONTAINMENT
	(gallons)			
TANK F	FARM B (Exterior)			
12	10,000	Stoddard Solvent	Horizontal AST	Concrete Secondary Containment Unit
13	10,000	Empty	Horizontal AST	Concrete Secondary Containment Unit
13A	500	Diesel	Horizontal AST	Concrete Secondary Containment Unit
TANK	FARM C (Interior)			
4	3,000	Blender	Vertical AST	Concrete Secondary Containment Unit
5	3,000	Blender	Vertical AST	Concrete Secondary Containment Unit
6	10,000	Swing Tank	Vertical AST	Concrete Secondary Containment Unit
7	10,000	Hydraulic	Vertical AST	Concrete Secondary Containment Unit
14	3,000	Motor Oil	Vertical AST	Concrete Secondary Containment Unit
15	5,000	Motor Oil	Vertical AST	Concrete Secondary Containment Unit
16	5,000	Gear Oil	Vertical AST	Concrete Secondary Containment Unit

#### Table 2-1 (*Page 3 of 6*)

### SUMMARY OF OIL CONTAINERS – EAST PLANT

#### CHRISTENSON OIL COMPANY 3821-3865 N.W. ST. HELENS ROAD PORTLAND, OREGON

ID	STORAGE CAPACITY (gallons)	CONTAINER CONTENT	CONTAINER DESCRIPTION	DISCHARGE PREVENTION & CONTAINMENT
17	5,000	Hydraulic	Vertical AST	Concrete Secondary Containment Unit
18	5,000	Motor Oil	Vertical AST	Concrete Secondary Containment Unit
18	5,000	Motor Oil	Vertical AST	Concrete Secondary Containment Unit
20	5,000	Motor Oil	Vertical AST	Concrete Secondary Containment Unit
21	5,000	Hydraulic	Vertical AST	Concrete Secondary Containment Unit
22	8,000	ATF	Vertical AST	Concrete Secondary Containment Unit
TANK	FARM D (Interior)		 	
25	3,000	ATF	Vertical AST	Concrete Secondary Containment Unit
26	2,700/Sloped	Open	Vertical AST 변	Concrete Secondary Containment Unit
27	3,000	Motor Oil	Vertical AST 0	Concrete Secondary Containment Unit
28	3,000	Motor Oil	Vertical AST	Concrete Secondary Containment Unit
29	3,000	Motor Oil	Vertical AST	Concrete Secondary Containment Unit

#### Table 2-1 (Page 4 of 6)

#### **SUMMARY OF OIL CONTAINERS – EAST PLANT**

#### CHRISTENSON OIL COMPANY 3821-3865 N.W. ST. HELENS ROAD PORTLAND, OREGON

ID	STORAGE CAPACITY (gallons)	CONTAINER CONTENT	CONTAINER DESCRIPTION	DISCHARGE PREVENTION & CONTAINMENT
30	3,000	Motor Oil	Vertical AST	Concrete Secondary Containment Unit
31	3,000	Motor Oil	Vertical AST	Concrete Secondary Containment Unit
32	3,000	Motor Oil	Vertical AST	Concrete Secondary Containment Unit
33	3,000	Motor Oil	Vertical AST	Concrete Secondary Containment Unit
34	3,000	Motor Oil	Vertical AST	Concrete Secondary Containment Unit
TANK	FARM E (Interior)			
1	1,000	Soluble Oil	Vertical AST	Tanks empty after hours/Veeder Root tank overfill alarm system
2	1,700	Blender	Vertical AST	Tanks empty after hours/Veeder Root tank overfill alarm system
3	700	Blender	Vertical AST	Tanks empty after hours/Veeder Root tank overfill alarm system
8	2,000	Additive	Vertical AST	Tanks empty after hours/Veeder Root tank overfill alarm system
9	2,000	Additive	Vertical AST	Tanks empty after hours/Veeder Root tank overfill alarm system
10	1,700	Blender	Vertical AST	Tanks empty after hours/Veeder Root tank overfill alarm system

Table 2-1 (*Page 5 of 6*)

### SUMMARY OF OIL CONTAINERS - EAST PLANT

CHRISTENSON OIL COMPANY 3821-3865 N.W. ST. HELENS ROAD PORTLAND, OREGON

WES Project No. 07-0129

ID	STORAGE CAPACITY (gallons)	CONTAINER CONTENTS	CONTAINER DESCRIPTION	DISCHARGE PREVENTION & 0 CONTAINMENT
11	5,000	Motor Oil	Vertical AST	Tanks empty after hours/ Veeder Root tank overfill alarm system/
12	1,500	Blender	Vertical AST	Tanks empty after hours/ Veeder Root tank overfill alarm system/
23	2,700	Blender	Vertical AST	Tanks empty after hours/ Veeder Root tank everfill alarm system/
24	2,700	Blender	Vertical AST	Tanks empty after hours/ Veeder Root tank gverfill alarm system/
WAREH	OUSE INTERIOR			<u>N</u>
Drums		Oil-based lubricant products	55-gallon drums	Stored on concrete floor or palles/Periodic inspections/interior location
Totes		Oil-based lubricant products	300-gallon totes	Periodic inspections/interior location

Source: Wohlers May 30

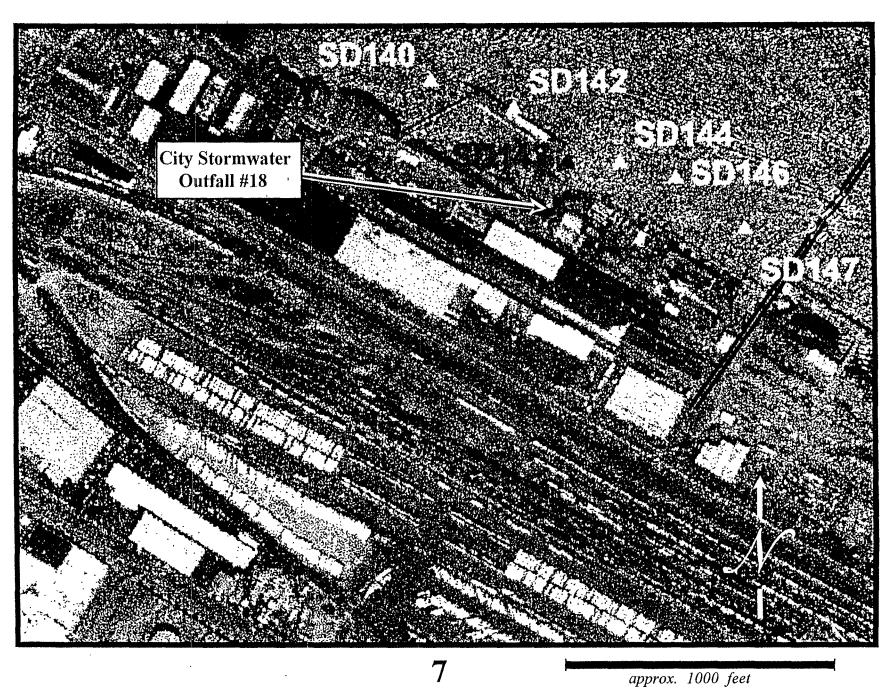
Enviro

Control

Prevention

## APPENDIX D OUTFALL #18 SEDIMENT SAMPLE LOCATIONS

SOURCE CONTROL EVALUATION REPORT CHRISTENSON OIL COMPANY PORTLAND, OREGON



## APPENDIX E LABORATORY ANALYTICAL REPORTS

SOURCE CONTROL EVALUATION REPORT CHRISTENSON OIL COMPANY PORTLAND, OREGON

#### **ENVIRONMENTAL CHEMISTS**

James E. Bruya, Ph.D. Charlene Morrow, M.S. Yelena Aravkina, M.S. Bradley T. Benson, B.S. Kurt Johnson, B.S.

3012 16th Avenue West Seattle, WA 98119-2029 TEL: (206) 285-8282 FAX: (206) 283-5044 e-mail: fbi@isomedia.com

April 13, 2011

Chris Wohlers, Project Manager Wohlers Environmental Services, Inc. 7440 S.W. Hunziker St., Suite C Tigard, OR 97223

Dear Mr. Wohlers:

Included are the amended results from the testing of material submitted on December 2, 2010 from the 10-0002(9) Christenson CB Sediment Sampling, F&BI 012027 project. The VOCs were removed from the report.

We apologize for any inconvenience and hope you will call if you should have any questions.

Sincerely,

FRIEDMAN & BRUYA. INC.

Michael Erdahl Project Manager

Enclosures

c: Kelly Barber, Evelyn Cummings, Greg Lish

WOH1222R.DOC

#### **ENVIRONMENTAL CHEMISTS**

James E. Bruya, Ph.D. Charlene Morrow, M.S. Yelena Aravkina, M.S. Bradley T. Benson, B.S. Kurt Johnson, B.S. 3012 16th Avenue West Seattle, WA 98119-2029 TEL: (206) 285-8282 FAX: (206) 283-5044 e-mail: fbi@isomedia.com

December 22, 2010

Chris Wohlers, Project Manager Wohlers Environmental Services, Inc. 7440 S.W. Hunziker St., Suite C Tigard, OR 97223

Dear Mr. Wohlers:

Included are the results from the testing of material submitted on December 2, 2010 from the 10-0002(9) Christenson CB Sediment Sampling, F&BI 012027 project. There are 23 pages included in this report. Any samples that may remain are currently scheduled for disposal in 30 days. If you would like us to return your samples or arrange for long term storage at our offices, please contact us as soon as possible.

We appreciate this opportunity to be of service to you and hope you will call if you should have any questions.

Sincerely,

FRIEDMAN & BRUYA, INC.

Michael Erdahl Project Manager

Enclosures

c: Kelly Barber, Evelyn Cummings

WOH1222R.DOC

# FRIEDMAN & BRUYA, INC. ENVIRONMENTAL CHEMISTS

#### CASE NARRATIVE

This case narrative encompasses samples received on December 2, 2010 by Friedman & Bruya, Inc. from the Wohlers Environmental Services 10-0002(9) Christenson CB Sediment Sampling, F&BI 012027 project. Samples were logged in under the laboratory ID's listed below.

<u>Laboratory ID</u> <u>Wohlers Environmental Services</u>

012027-01 SED-CB-1-F 120110 012027-02 SED-CB-1-B 120110

The samples were sent to Amtest for grain size and total organic carbon analyses. The report generated by Amtest will be forwarded to your office upon receipt.

The 8260C relative percent difference from the laboratory control sample and laboratory control sample duplicate analysis was outside of control limits for several compounds. The compounds were not detected, therefore the data were considered acceptable.

All other quality control requirements were acceptable.

#### **ENVIRONMENTAL CHEMISTS**

Date of Report: 12/22/10 Date Received: 12/02/10

Project: 10-0002(9) Christenson CB Sediment Sampling, F&BI 012027

Date Extracted: 12/03/10 Date Analyzed: 12/03/10

#### RESULTS FROM THE ANALYSIS OF SOIL SAMPLES FOR TOTAL PETROLEUM HYDROCARBONS AS GASOLINE USING METHOD NWTPH-Gx

Results Reported on a Dry Weight Basis Results Reported as mg/kg (ppm)

Sample ID Laboratory ID	Gasoline Range	Surrogate (% Recovery) (Limit 50-150)
SED-CB-1-F 120110 012027-01	<2	57
SED-CB-1-B 120110 012027-02	35	50
Method Blank <sub>00-1988 MB</sub>	<2	92

#### **ENVIRONMENTAL CHEMISTS**

Date of Report: 12/22/10 Date Received: 12/02/10

Project: 10-0002(9) Christenson CB Sediment Sampling, F&BI 012027

Date Extracted: 12/03/10

Date Analyzed: 12/03/10 and 12/04/10

#### RESULTS FROM THE ANALYSIS OF SOIL SAMPLES FOR TOTAL PETROLEUM HYDROCARBONS AS DIESEL AND MOTOR OIL USING METHOD NWTPH-Dx

Results Reported on a Dry Weight Basis Results Reported as mg/kg (ppm)

Sample ID Laboratory ID	$\frac{\text{Diesel Range}}{(C_{10}\text{-}C_{25})}$	Motor Oil Range (C <sub>25</sub> -C <sub>36</sub> )	Surrogate (% Recovery) (Limit 53-144)
SED-CB-1-F 120110 012027-01	1,700 x	12,000	100
SED-CB-1-B 120110 012027-02	3,000 x	16,000	105
Method Blank	< 50	<250	119

#### ENVIRONMENTAL CHEMISTS

#### Analysis For Total Metals By EPA Method 200.8

Client ID: SED-CB-1-F 120110 Client: Wohlers Environmental Services
Date Received: 12/02/10 Project: 10-0002(9) Christenson, F&BI 012027

 Date Extracted:
 12/06/10
 Lab ID:
 012027-01

 Date Analyzed:
 12/06/10
 Data File:
 012027-01.021

 Matrix:
 Soil
 Instrument:
 ICPMS1

 Units:
 mg/kg (ppm)
 Operator:
 AP

		Lower	Upper
Internal Standard:	% Recovery:	Limit:	Limit:
Germanium	100	60	125
Indium	94	60	125
Holmium	99	60	125

179

Analyte:	Concentration mg/kg (ppm)
Chromium	36.0
Nickel	19.3
Copper	43.8
Zinc	376
Arsenic	2.54
Selenium	<1
Silver	<1
Cadmium	1.56
Barium	67.2
Lead	50.2

Manganese

#### ENVIRONMENTAL CHEMISTS

#### Analysis For Total Metals By EPA Method 200.8

Client ID: SED-CB-1-B 120110 Client: Wohlers Environmental Services
Date Received: 12/02/10 Project: 10-0002(9) Christenson, F&BI 012027

 Date Extracted:
 12/06/10
 Lab ID:
 012027-02

 Date Analyzed:
 12/06/10
 Data File:
 012027-02.022

 Matrix:
 Soil
 Instrument:
 ICPMS1

 Units:
 mg/kg (ppm)
 Operator:
 AP

		Lower	Upper
Internal Standard:	% Recovery:	Limit:	Limit:
Germanium	103	60	125
Indium	94	60	125
Holmium	102	60	125

84.6

243

Analyte:	Concentration mg/kg (ppm)
Chromium	70.3
Nickel	47.4
Copper	72.4
Zinc	584
Arsenic	4.48
Selenium	<1
Silver	<1
Cadmium	2.87
Barium	99.5

Lead

Manganese

#### **ENVIRONMENTAL CHEMISTS**

#### Analysis For Total Metals By EPA Method 200.8

Client ID: Method Blank Client: Wohlers Environmental Services
Date Received: Not Applicable Project: 10-0002(9) Christenson, F&BI 012027

Date Extracted: 12/06/10 Lab ID: I0-694 mb
Date Analyzed: 12/08/10 Data File: I0-694 mb.024
Matrix: Soil Instrument: ICPMS1
Units: mg/kg (ppm) Operator: AP

		Lower	Upper
Internal Standard:	% Recovery:	Limit:	Limit:
Germanium	96	60	125
Indium	88	60	125
Holmium	94	60	125

Concentration
Analyte: mg/kg (ppm)

Chromium <1 Nickel <1 Copper <1 Zinc <1 Arsenic <1 Selenium <1 Silver <1 Cadmium <1 Barium <1 Lead <1 Manganese <1

#### **ENVIRONMENTAL CHEMISTS**

Date of Report: 12/22/10 Date Received: 12/02/10

Project: 10-0002(9) Christenson CB Sediment Sampling, F&BI 012027

Date Extracted: 12/06/10 Date Analyzed: 12/06/10

#### RESULTS FROM THE ANALYSIS OF THE SOIL SAMPLES FOR TOTAL MERCURY USING EPA METHOD 1631E

Results Reported on a Dry Weight Basis Results Reported as mg/kg (ppm)

Sample ID Laboratory ID	Total Mercury
SED-CB-1-F 120110 012027-01	<0.2
SED-CB-1-B 120110 012027-02	<0.2
Method Blank	<0.2

#### **ENVIRONMENTAL CHEMISTS**

Date of Report: 12/22/10 Date Received: 12/02/10

Project: 10-0002(9) Christenson CB Sediment Sampling, F&BI 012027

Date Extracted: 12/03/10 Date Analyzed: 12/07/10

#### RESULTS FROM THE ANALYSIS OF SOIL SAMPLES FOR PCBs REPORTED AS AROCLORS USING EPA METHOD 8082A

Results Reported on a Dry Weight Basis Results Reported as mg/kg (ppm)

Sample ID Laboratory ID	Aroclo <u>1221</u>	or <u>1232</u>	<u>1016</u>	<u>1242</u>	<u>1248</u>	<u>1254</u>	<u>1260</u>	Surrogate (% Rec.) (Limit 50-150)
SED-CB-1-F 120110 012027-01	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	90
SED-CB-1-B 120110 012027-02	< 0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	53
Method Blank	< 0.1	< 0.1	< 0.1	<0.1	< 0.1	<0.1	< 0.1	95

#### ENVIRONMENTAL CHEMISTS

### Analysis For Semivolatile Compounds By EPA Method 8270D SIM

Client	t Sample ID:	SED-CB-1-F 120110	Client:	Wohlers Environmental Services
Date	Received:	12/02/10	Project:	10-0002(9) Christenson, F&BI 012027

 Date Extracted:
 12/06/10
 Lab ID:
 012027-01 1/50

 Date Analyzed:
 12/07/10
 Data File:
 120716.D

 Matrix:
 Soil
 Instrument:
 GCMS6

 Units:
 mg/kg (ppm)
 Operator:
 YA

_	=	Lower	Upper
Surrogates:	% Recovery:	Limit:	Limit:
Anthracene-d10	65	50	150
Benzo(a)anthracene-d12	129	35	159

• •	
	Concentration
Compounds:	mg/kg (ppm)
1	0 0 11 ,
Naphthalene	< 0.1
Acenaphthylene	< 0.1
Acenaphthene	< 0.1
Fluorene	< 0.1
Phenanthrene	0.35
Anthracene	< 0.1
Fluoranthene	0.39
Pyrene	0.93
Benz(a)anthracene	0.19
Chrysene	0.49
Benzo(a)pyrene	0.17
Benzo(b)fluoranthene	0.31
Benzo(k)fluoranthene	< 0.1
Indeno(1,2,3-cd)pyrene	0.18
Dibenz(a,h)anthracene	< 0.1
Benzo(g,h,i)perylene	0.25

#### **ENVIRONMENTAL CHEMISTS**

#### Analysis For Semivolatile Compounds By EPA Method 8270D SIM

Client Sample ID: SED-CB-1-B 120110 Client: Wohlers Environmental Services
Date Received: 12/02/10 Project: 10-0002(9) Christenson, F&BI 012027

 Date Extracted:
 12/06/10
 Lab ID:
 012027-02 1/50

 Date Analyzed:
 12/07/10
 Data File:
 120717.D

 Matrix:
 Soil
 Instrument:
 GCMS6

 Units:
 mg/kg (ppm)
 Operator:
 YA

Surrogates: % Recovery: Limit: Limit: Anthracene-d10 50 50 150 Benzo(a)anthracene-d12 118 35 159

Concentration Compounds: mg/kg (ppm) Naphthalene < 0.1 Acenaphthylene < 0.1 Acenaphthene < 0.1 Fluorene < 0.1 Phenanthrene 0.28 Anthracene < 0.1 Fluoranthene 0.52 **Pyrene** 0.51 Benz(a)anthracene 0.26 Chrysene 0.45 Benzo(a)pyrene 0.28 Benzo(b)fluoranthene 0.47 Benzo(k)fluoranthene 0.13 Indeno(1,2,3-cd)pyrene 0.28 Dibenz(a,h)anthracene < 0.1 Benzo(g,h,i)perylene 0.37

#### **ENVIRONMENTAL CHEMISTS**

#### Analysis For Semivolatile Compounds By EPA Method 8270D SIM

Client Sample ID: Method Blank Client: Wohlers Environmental Services

Date Received: Not Applicable Project: 10-0002(9) Christenson, F&BI 012027

Date Extracted:12/06/10Lab ID:00-1997mb2Date Analyzed:12/07/10Data File:120703.DMatrix:SoilInstrument:GCMS6Units:mg/kg (ppm)Operator:YA

Lower Upper Surrogates: % Recovery: Limit: Limit: Anthracene-d10 78 50 150 Benzo(a)anthracene-d12 84 50 129

Concentration Compounds: mg/kg (ppm) Naphthalene < 0.01 Acenaphthylene < 0.01 Acenaphthene < 0.01 Fluorene < 0.01 Phenanthrene < 0.01 Anthracene < 0.01 Fluoranthene < 0.01 **Pyrene** < 0.01 Benz(a)anthracene < 0.01 Chrysene < 0.01 Benzo(a)pyrene < 0.01 Benzo(b)fluoranthene < 0.01 Benzo(k)fluoranthene < 0.01 Indeno(1,2,3-cd)pyrene < 0.01 Dibenz(a,h)anthracene < 0.01 Benzo(g,h,i)perylene < 0.01

#### ENVIRONMENTAL CHEMISTS

### Analysis For Semivolatile Compounds By EPA Method 8270D

Client Sample ID:	SED-CB-1-F 120110	Client:	Wohlers Environmental Services
Date Received:	12/02/10	Project:	10-0002(9) Christenson, F&BI 012027
Date Extracted:	12/06/10	Lab ID:	012027-01 1/50
Date Analyzed:	12/14/10	Data File:	121414.D
Matrix:	Soil	Instrument:	GCMS3
Units:	mg/kg (ppm)	Operator:	YA

		Lower	Upper
Surrogates:	% Recovery:	Limit:	Lîmit:
2-Fluorophenol	112	30	118
Phenol-d6	109	30	118
Nitrobenzene-d5	104	10	180
2-Fluorobiphenyl	119	40	130
2,4,6-Tribromophenol	90	16	116
Terphenyl-d14	126	30	144

Compounds:	Concentration mg/kg (ppm)	Compounds:	Concentration mg/kg (ppm)
•	0 0 11	•	
Phenol	<15	3-Nitroaniline	<45
Bis(2-chloroethyl) ether	<1.5	Acenaphthene	<1.5
2-Chlorophenol	<15	2,4-Dinitrophenol	<45
1,3-Dichlorobenzene	<1.5	Dibenzofuran	<1.5
1,4-Dichlorobenzene	<1.5	2,4-Dinitrotoluene	<1.5
1,2-Dichlorobenzene	<1.5	4-Nitrophenol	<15
Benzyl alcohol	<1.5	Diethyl phthalate	<1.5
Bis(2-chloroisopropyl) ether	<1.5	Fluorene	<1.5
2-Methylphenol	<15	4-Chlorophenyl phenyl ether	<1.5
Hexachloroethane	<1.5	N-Nitrosodiphenylamine	<1.5
N-Nitroso-di-n-propylamine	<1.5	4-Nitroaniline	<45
3-Methylphenol + 4-Methylph	enol <30	4,6-Dinitro-2-methylphenol	<45
Nitrobenzene	<1.5	4-Bromophenyl phenyl ether	<1.5
Isophorone	<1.5	Hexachlorobenzene	<1.5
2-Nitrophenol	<15	Pentachlorophenol	<15
2,4-Dimethylphenol	<15	Phenanthrene	<1.5
Benzoic acid	<75	Anthracene	<1.5
Bis(2-chloroethoxy)methane	<1.5	Carbazole	<1.5
2,4-Dichlorophenol	<15	Di-n-butyl phthalate	<1.5
1,2,4-Trichlorobenzene	<1.5	Fluoranthene	<1.5
Naphthalene	<1.5	Pyrene	<1.5
Hexachlorobutadiene	<1.5	Benzyl butyl phthalate	<1.5
4-Chloroaniline	<150	Benz(a)anthracene	<1.5
4-Chloro-3-methylphenol	<15	Chrysene	<1.5
2-Methylnaphthålene	<1.5	Bis(2-ethylhexyl) phthalate	32
Hexachlorocyclopentadiene	<4.5	Di-n-octyl phthalate	<1.5
2,4,6-Trichlorophenol	<15	Benzo(a)pyrene	<1.5
2,4,5-Trichlorophenol	<15	Benzo(b)fluoranthene	<1.5
2-Chloronaphthalene	<1.5	Benzo(k)fluoranthene	<1.5
2-Nitroaniline	<1.5	Indeno(1,2,3-cd)pyrene	<1.5
Dimethyl phthalate	<1.5	Dibenz(a,h)anthracene	<1.5
Acenaphthylene	<1.5	Benzo(g,h,i)perylene	<1.5
2,6-Dinitrotoluene	<1.5	O //I J	

#### ENVIRONMENTAL CHEMISTS

### Analysis For Semivolatile Compounds By EPA Method 8270D

Client Sample ID:	SED-CB-1-B 120110	Client:	Wohlers Environmental Services
Date Received:	12/02/10	Project:	10-0002(9) Christenson, F&BI 012027
Date Extracted:	12/06/10	Lab ID:	012027-02 1/50
Date Analyzed:	12/14/10	Data File:	121415.D
Matrix:	Soil	Instrument:	GCMS3
Units:	mg/kg (ppm)	Operator:	YA

		Lower	Upper
Surrogates:	% Recovery:	Limit:	Limit:
2-Fluorophenol	110	30	118
Phenol-d6	110	30	118
Nitrobenzene-d5	110	10	180
2-Fluorobiphenyl	117	40	130
2,4,6-Tribromophenol	90	16	116
Terphenyl-d14	126	30	144

Compounds:	Concentration mg/kg (ppm)	Compounds:	Concentration mg/kg (ppm)
Phenol	<15	3-Nitroaniline	<45
Bis(2-chloroethyl) ether	<1.5 <1.5		<45 <1.5
2-Chlorophenol	<1.5 <15	Acenaphthene 2,4-Dinitrophenol	<1.5 <45
1,3-Dichlorobenzene	<1.5	Dibenzofuran	<4.5 <1.5
1,4-Dichlorobenzene	<1.5	2,4-Dinitrotoluene	<1.5
1,2-Dichlorobenzene	<1.5 <1.5		<1.5 <15
	<1.5 <1.5	4-Nitrophenol	<1.5 <1.5
Benzyl alcohol		Diethyl phthalate	
Bis(2-chloroisopropyl) ether	< 1.5	Fluorene	< 1.5
2-Methylphenol Hexachloroethane	<15	4-Chlorophenyl phenyl ether	<1.5 <1.5
	< 1.5	N-Nitrosodiphenylamine	
N-Nitroso-di-n-propylamine	<1.5	4-Nitroaniline	<45
3-Methylphenol + 4-Methylphe	enoi <30	4,6-Dinitro-2-methylphenol	<45
Nitrobenzene	< 1.5	4-Bromophenyl phenyl ether	< 1.5
Isophorone	<1.5	Hexachlorobenzene	<1.5
2-Nitrophenol	<15	Pentachlorophenol	<15
2,4-Dimethylphenol	<15	Phenanthrene	<1.5
Benzoic acid	<75	Anthracene	<1.5
Bis(2-chloroethoxy)methane	<1.5	Carbazole	<1.5
2,4-Dichlorophenol	<15	Di-n-butyl phthalate	<1.5
1,2,4-Trichlorobenzene	<1.5	Fluoranthene	<1.5
Naphthalene	<1.5	Pyrene	<1.5
Hexachlorobutadiene	<1.5	Benzyl butyl phthalate	3.3
4-Chloroaniline	<150	Benz(a)anthracene	<1.5
4-Chloro-3-methylphenol	<15	Chrysene	<1.5
2-Methylnaphthalene	<1.5	Bis(2-ethylhexyl) phthalate	38
Hexachlorocyclopentadiene	<4.5	Di-n-octyl phthalate	2.0
2,4,6-Trichlorophenol	<15	Benzo(a)pyrene	<1.5
2,4,5-Trichlorophenol	<15	Benzo(b)fluoranthene	<1.5
2-Chloronaphtĥalene	<1.5	Benzo(k)fluoranthene	<1.5
2-Nitroaniline	<1.5	Indeno(1,2,3-cd)pyrene	<1.5
Dimethyl phthalate	<1.5	Dibenz(a,h)anthracene	<1.5
Acenaphthylene	<1.5	Benzo(g,h,i)perylene	<1.5
2,6-Dinitrotoluene	<1.5	2 2	

#### ENVIRONMENTAL CHEMISTS

#### Analysis For Semivolatile Compounds By EPA Method 8270D

Client Sample ID:	Method Blank	Client:	Wohlers Environmental Services
Date Received:	Not Applicable	Project:	10-0002(9) Christenson, F&BI 012027
Date Extracted:	12/06/10	Lab ID:	00-1998 mb
Date Analyzed:	12/09/10	Data File:	120916.D
Matrix:	Soil	Instrument:	GCMS3
Units:	mg/kg (ppm)	Operator:	YA

		Lower	Upper
Surrogates:	% Recovery:	Limit:	Lîmit:
2-Fluorophenol	76	30	118
Phenol-d6	76	30	118
Nitrobenzene-d5	84	10	180
2-Fluorobiphenyl	82	40	130
2,4,6-Tribromophenol	79	16	116
Terphenyl-d14	85	30	144

	Concentration		Concentration
Compounds:	mg/kg (ppm)	Compounds:	mg/kg (ppm)
Phenol	< 0.3	3-Nitroaniline	< 0.9
Bis(2-chloroethyl) ether	< 0.03	Acenaphthene	< 0.03
2-Chlorophenol	< 0.3	2,4-Dinitrophenol	< 0.9
1,3-Dichlorobenzene	< 0.03	Dibenzofuran	< 0.03
1,4-Dichlorobenzene	< 0.03	2,4-Dinitrotoluene	< 0.03
1,2-Dichlorobenzene	< 0.03	4-Nitrophenol	< 0.3
Benzyl alcohol	< 0.03	Diethyl phthalate	< 0.03
Bis(2-chloroisopropyl) ether	< 0.03	Fluorene	< 0.03
2-Methylphenol	< 0.3	4-Chlorophenyl phenyl ether	< 0.03
Hexachloroethane	< 0.03	N-Nitrosodiphenylamine	< 0.03
N-Nitroso-di-n-propylamine	< 0.03	4-Nitroaniline	< 0.9
3-Methylphenol + 4-Methylpher	nol <0.6	4,6-Dinitro-2-methylphenol	< 0.9
Nitrobenzene	< 0.03	4-Bromophenyl phenyl ether	< 0.03
Isophorone	< 0.03	Hexachlorobenzene	< 0.03
2-Nitrophenol	< 0.3	Pentachlorophenol	< 0.3
2,4-Dimethylphenol	< 0.3	Phenanthrene	< 0.03
Benzoic acid	<1.5	Anthracene	< 0.03
Bis(2-chloroethoxy)methane	< 0.03	Carbazole	< 0.03
2,4-Dichlorophenol	< 0.3	Di-n-butyl phthalate	< 0.03
1,2,4-Trichlorobenzene	< 0.03	Fluoranthene	< 0.03
Naphthalene	< 0.03	Pyrene	< 0.03
Hexachlorobutadiene	< 0.03	Benzyl butyl phthalate	< 0.03
4-Chloroaniline	<3	Benz(a)anthracene	< 0.03
4-Chloro-3-methylphenol	< 0.3	Chrysene	< 0.03
2-Methylnaphthålene	< 0.03	Bis(2-ethylhexyl) phthalate	< 0.3
Hexachlorocyclopentadiene	< 0.09	Di-n-octyl phthalate	< 0.03
2,4,6-Trichlorophenol	< 0.3	Benzo(a)pyrene	< 0.03
2,4,5-Trichlorophenol	< 0.3	Benzo(b)fluoranthene	< 0.03
2-Chloronaphthalene	< 0.03	Benzo(k)fluoranthene	< 0.03
2-Nitroaniline	< 0.03	Indeno(1,2,3-cd)pyrene	< 0.03
Dimethyl phthalate	< 0.03	Dibenz(a,h)anthracene	< 0.03
Acenaphthylene	< 0.03	Benzo(g,h,i)perylene	< 0.03
2,6-Dinitrotoluene	< 0.03		

#### ENVIRONMENTAL CHEMISTS

Date of Report: 12/22/10 Date Received: 12/02/10

Project: 10-0002(9) Christenson CB Sediment Sampling, F&BI 012027

#### QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF SOIL SAMPLES FOR TPH AS GASOLINE USING NWTPH-Gx

Laboratory Code: 011325-02 (Duplicate)

		(Wet Wt)	(Wet Wt)	Relative Percent
	Reporting	Sample	Duplicate	Difference
Analyte	Units	Result	Result	(Limit 20)
Gasoline	mg/kg (ppm)	3 a	4 a	29 a

			Percent		
	Reporting	Spike	Recovery	Acceptance	
Analyte	Units	Level	LCS	Criteria	
Gasoline	mg/kg (ppm)	20	80	71-131	-

#### ENVIRONMENTAL CHEMISTS

Date of Report: 12/22/10 Date Received: 12/02/10

Project: 10-0002(9) Christenson CB Sediment Sampling, F&BI 012027

### QUALITY ASSURANCE RESULTS FROM THE ANALYSIS OF SOIL SAMPLES FOR TOTAL PETROLEUM HYDROCARBONS AS DIESEL EXTENDED USING METHOD NWTPH-Dx

Laboratory Code: 012036-04 (Matrix Spike)

			(Wet wt)	Percent	Percent		
	Reporting	Spike	Sample	Recovery	Recovery	Acceptance	RPD
Analyte	Units	Level	Result	MS	MSD	Criteria	(Limit 20)
Diesel Extended	mg/kg (ppm)	5,000	< 50	103	101	64-133	2

			Percent	
	Reporting	Spike	Recovery	Acceptance
Analyte	Units	Level	LCS	Criteria
Diesel Extended	mg/kg (ppm)	5,000	106	58-147

#### ENVIRONMENTAL CHEMISTS

Date of Report: 12/22/10 Date Received: 12/02/10

Project: 10-0002(9) Christenson CB Sediment Sampling, F&BI 012027

#### QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF SOIL SAMPLES FOR TOTAL METALS USING EPA METHOD 200.8

Laboratory Code: 012053-11 (Matrix Spike)

				Percent	Percent		
	Reporting	Spike	Sample	Recovery	Recovery	Acceptance	RPD
Analyte	Units	Level	Result	MS	MSD	Criteria	(Limit 20)
Chromium	mg/kg (ppm)	50	10.4	80 b	79 b	51-132	1 b
Nickel	mg/kg (ppm)	25	5.70	83 b	83 b	33-149	0 b
Copper	mg/kg (ppm)	50	407	0 b	2 b	53-123	200 b
Zinc	mg/kg (ppm)	50	95.6	100 b	71 b	40-135	34 b
Arsenic	mg/kg (ppm)	10	4.70	93 b	105 b	44-151	12 b
Selenium	mg/kg (ppm)	5	<1	81	81	52-128	0
Silver	mg/kg (ppm)	10	<1	98	100	69-125	2
Cadmium	mg/kg (ppm)	10	<1	102	106	83-120	4
Barium	mg/kg (ppm)	50	162	117 b	137 b	47-147	16 b
Lead	mg/kg (ppm)	50	14.4	105 b	109 b	65-126	4 b
Manganese	mg/kg (ppm)	20	641	98 b	446 b	65-126	128 b

			Percent	
	Reporting	Spike	Recovery	Acceptance
Analyte	Units	Level	LCS	Criteria
Chromium	mg/kg (ppm)	50	100	79-125
Nickel	mg/kg (ppm)	25	103	84-116
Copper	mg/kg (ppm)	50	101	86-114
Zinc	mg/kg (ppm)	50	102	79-120
Arsenic	mg/kg (ppm)	10	106	80-120
Selenium	mg/kg (ppm)	5	103	81-121
Silver	mg/kg (ppm)	10	104	84-117
Cadmium	mg/kg (ppm)	10	107	89-116
Barium	mg/kg (ppm)	50	102	88-113
Lead	mg/kg (ppm)	50	103	81-120
Manganese	mg/kg (ppm)	20	102	81-120

#### **ENVIRONMENTAL CHEMISTS**

Date of Report: 12/22/10 Date Received: 12/02/10

Project: 10-0002(9) Christenson CB Sediment Sampling, F&BI 012027

#### **QUALITY ASSURANCE RESULTS** FOR THE ANALYSIS OF SOIL SAMPLES FOR **TOTAL MERCURY USING EPA METHOD 1631E**

Laboratory Code: 012053-11 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result	Percent Recover y MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Mercury	mg/kg (ppm)	0.125	<0.2	111	96	45-162	14
Laboratory Code:	Laboratory Con	trol Sam	ple				

	Reporting	Spike	Percent Recover	Acceptance
Analyte	Units	Level	y LCS	Criteria
Mercury	mg/kg (ppm)	0.125	116	63-144

#### ENVIRONMENTAL CHEMISTS

Date of Report: 12/22/10 Date Received: 12/02/10

Project: 10-0002(9) Christenson CB Sediment Sampling, F&BI 012027

#### QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF SOIL SAMPLES FOR POLYCHLORINATED BIPHENYLS AS AROCLOR 1016/1260 BY EPA METHOD 8082A

Laboratory Code: 010112-67 (Matrix Spike)

				Percent	Percent		
	Reporting	Spike	Sample	Recovery	Recovery	Control	RPD
Analyte	Units	Level	Result	MS	MSD	Limits	(Limit 20)
Aroclor 1016	mg/kg (ppm)	0.8	< 0.1	84	84	68-127	0
Aroclor 1260	mg/kg (ppm)	0.8	< 0.1	96	95	63-140	1

	Reporting	Spike	% Recovery	% Recovery	Acceptance	RPD
Analyte	Units	Level	LCS	LCSD	Criteria	(Limit 20)
Aroclor 1016	mg/kg (ppm)	0.8	95	101	60-142	6
Aroclor 1260	mg/kg (ppm)	0.8	93	98	63-144	5

#### ENVIRONMENTAL CHEMISTS

Date of Report: 12/22/10 Date Received: 12/02/10

Project: 10-0002(9) Christenson CB Sediment Sampling, F&BI 012027

#### QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF SOIL SAMPLES FOR PNA'S BY EPA METHOD 8270D SIM

Laboratory Code: 012053-11 (Duplicate)

Laboratory Code: 012003-11 (Duplicate)									
				Relative Percent					
	Reporting	Sample	Duplicate	Difference					
Analyte	Units	Result	Result	(Limit 20)					
Naphthalene	mg/kg (ppm)	< 0.01	< 0.01	nm					
Acenaphthylene	mg/kg (ppm)	< 0.01	< 0.01	nm					
Acenaphthene	mg/kg (ppm)	< 0.01	< 0.01	nm					
Fluorene	mg/kg (ppm)	< 0.01	< 0.01	nm					
Phenanthrene	mg/kg (ppm)	< 0.01	< 0.01	nm					
Anthracene	mg/kg (ppm)	< 0.01	< 0.01	nm					
Fluoranthene	mg/kg (ppm)	< 0.01	< 0.01	nm					
Pyrene	mg/kg (ppm)	< 0.01	< 0.01	nm					
Benz(a)anthracene	mg/kg (ppm)	< 0.01	< 0.01	nm					
Chrysene	mg/kg (ppm)	< 0.01	< 0.01	nm					
Benzo(b)fluoranthene	mg/kg (ppm)	< 0.01	< 0.01	nm					
Benzo(k)fluoranthene	mg/kg (ppm)	< 0.01	< 0.01	nm					
Benzo(a)pyrene	mg/kg (ppm)	< 0.01	< 0.01	nm					
Indeno(1,2,3-cd)pyrene	mg/kg (ppm)	< 0.01	< 0.01	nm					
Dibenz(a,h)anthracene	mg/kg (ppm)	< 0.01	< 0.01	nm					
Benzo(g,h,i)perylene	mg/kg (ppm)	< 0.01	< 0.01	nm					

			Percent	Percent		
	Reporting	Spike	Recovery	Recovery	Acceptance	RPD
Analyte	Units	Level	LCS	LCSD	Criteria	(Limit 20)
Naphthalene	mg/kg (ppm)	0.17	85	92	72-112	8
Acenaphthylene	mg/kg (ppm)	0.17	83	92	63-110	10
Acenaphthene	mg/kg (ppm)	0.17	84	91	70-111	8
Fluorene	mg/kg (ppm)	0.17	85	93	69-110	9
Phenanthrene	mg/kg (ppm)	0.17	82	90	68-111	9
Anthracene	mg/kg (ppm)	0.17	74	81	67-110	9
Fluoranthene	mg/kg (ppm)	0.17	82	92	62-114	11
Pyrene	mg/kg (ppm)	0.17	82	92	61-114	11
Benz(a)anthracene	mg/kg (ppm)	0.17	80	89	58-108	11
Chrysene	mg/kg (ppm)	0.17	85	94	61-112	10
Benzo(b)fluoranthene	mg/kg (ppm)	0.17	83	94	54-119	12
Benzo(k)fluoranthene	mg/kg (ppm)	0.17	85	94	61-123	10
Benzo(a)pyrene	mg/kg (ppm)	0.17	76	86	52-112	12
Indeno(1,2,3-cd)pyrene	mg/kg (ppm)	0.17	82	95	44-133	15
Dibenz(a,h)anthracene	mg/kg (ppm)	0.17	83	92	57-119	10
Benzo(g,h,i)perylene	mg/kg (ppm)	0.17	84	92	60-116	9

#### ENVIRONMENTAL CHEMISTS

Date of Report: 12/22/10 Date Received: 12/02/10

Project: 10-0002(9) Christenson CB Sediment Sampling, F&BI 012027

#### QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF SOIL SAMPLES FOR SEMIVOLATILES BY EPA METHOD 8270D

Laboratory Code: 012027-02 1/50 (Duplicate)

Analyte	Reporting Units	Sample Result	Duplicate Result	RPD (Limit 20)
Phenol	mg/kg (ppm)	<15	<15	nm
Bis(2-chloroethyl) ether	mg/kg (ppm)	<1.5	<1.5	nm
2-Chlorophenol	mg/kg (ppm)	<15	<15	nm
1,3-Dichlorobenzene	mg/kg (ppm)	<1.5	<1.5	nm
1,4-Dichlorobenzene	mg/kg (ppm)	<1.5	<1.5	nm
1,2-Dichlorobenzene	mg/kg (ppm)	<1.5	<1.5	nm
Benzyl alcohol	mg/kg (ppm)	<1.5	<1.5	nm
Bis(2-chloroisopropyl) ether	mg/kg (ppm)	<1.5	<1.5	nm
2-Methylphenol	mg/kg (ppm)	<15	< 15	nm
Hexachloroethane	mg/kg (ppm)	<1.5	<1.5	nm
N-Nitroso-di-n-propylamine	mg/kg (ppm)	<1.5	<1.5	nm
3-Methylphenol + 4-Methylphenol	mg/kg (ppm)	<30	<30	nm
Nitrobenzene	mg/kg (ppm)	<1.5	<1.5	nm
Isophorone	mg/kg (ppm)	<1.5	<1.5	nm
2-Nitrophenol	mg/kg (ppm)	<15	< 15	nm
2,4-Dimethylphenol	mg/kg (ppm)	<15	< 15	nm
Benzoic acid	mg/kg (ppm)	<75	<75	nm
Bis(2-chloroethoxy)methane	mg/kg (ppm)	<1.5	<1.5	nm
2,4-Dichlorophenol	mg/kg (ppm)	<15	<15	nm
1,2,4-Trichlorobenzene	mg/kg (ppm)	<1.5	<1.5	nm
Naphthalene	mg/kg (ppm)	<1.5	<1.5	nm
Hexachlorobutadiene	mg/kg (ppm)	<1.5	<1.5	nm
4-Chloroaniline	mg/kg (ppm)	<150	<150	nm
4-Chloro-3-methylphenol	mg/kg (ppm)	<15	< 15	nm
2-Methylnaphthalene	mg/kg (ppm)	<1.5	<1.5	nm
Hexachlorocyclopentadiene	mg/kg (ppm)	<4.5	<4.5	nm
2,4,6-Trichlorophenol	mg/kg (ppm)	<15	< 15	nm
2,4,5-Trichlorophenol	mg/kg (ppm)	<15	< 15	nm
2-Chloronaphthalene	mg/kg (ppm)	<1.5	<1.5	nm
2-Nitroaniline	mg/kg (ppm)	<1.5	<1.5	nm
Dimethyl phthalate	mg/kg (ppm)	<1.5	<1.5	nm
Acenaphthylene	mg/kg (ppm)	<1.5	<1.5	nm
2,6-Dinitrotoluene	mg/kg (ppm)	<1.5	<1.5	nm
3-Nitroaniline	mg/kg (ppm)	<45	<45	nm
Acenaphthene	mg/kg (ppm)	<1.5	<1.5	nm
2,4-Dinitrophenol	mg/kg (ppm)	<45	<45	nm
Dibenzofuran	mg/kg (ppm)	<1.5	<1.5	nm
2,4-Dinitrotoluene	mg/kg (ppm)	<1.5	<1.5	nm
4-Nitrophenol	mg/kg (ppm)	<15	<15	nm
Diethyl phthalate	mg/kg (ppm)	<1.5	<1.5	nm
Fluorene	mg/kg (ppm)	<1.5	<1.5	nm
4-Chlorophenyl phenyl ether	mg/kg (ppm)	<1.5	<1.5	nm
N-Nitrosodiphenylamine	mg/kg (ppm)	<1.5	<1.5	nm
4-Nitroaniline	mg/kg (ppm)	<45	<45	nm
4,6-Dinitro-2-methylphenol	mg/kg (ppm)	<45	<45	nm
4-Bromophenyl phenyl ether	mg/kg (ppm)	<1.5	<1.5	nm
Hexachlorobenzene	mg/kg (ppm)	<1.5	<1.5	nm
Pentachlorophenol	mg/kg (ppm)	<15	<15	nm
Phenanthrene	mg/kg (ppm)	<1.5	<1.5	nm
Anthracene	mg/kg (ppm)	<1.5	<1.5	nm
Carbazole	mg/kg (ppm)	<1.5	<1.5	nm
Di-n-butyl phthalate	mg/kg (ppm)	<1.5	<1.5	nm
Fluoranthene	mg/kg (ppm)	<1.5	<1.5	nm
Pyrene	mg/kg (ppm)	<1.5	<1.5	nm
Benzyl butyl phthalate	mg/kg (ppm)	3.3	2.0	49 a
Benz(a)anthracene	mg/kg (ppm)	<1.5	<1.5	nm
Chrysene	mg/kg (ppm)	<1.5	<1.5	nm
Bis(2-ethylhexyl) phthalate	mg/kg (ppm)	38	39	3
Di-n-octyl phthalate	mg/kg (ppm)	<1.5	<1.5	nm
Benzo(a)pyrene	mg/kg (ppm)	<1.5	<1.5	nm
Benzo(b)fluoranthene		<1.5	<1.5	nm
Benzo(k)fluoranthene	mg/kg (ppm)			
	mg/kg (ppm)	<1.5	<1.5	nm
Indeno(1,2,3-cd)pyrene	mg/kg (ppm) mg/kg (ppm)	<1.5 <1.5	<1.5	nm
	mg/kg (ppm)	<1.5		

#### ENVIRONMENTAL CHEMISTS

Date of Report: 12/22/10 Date Received: 12/02/10

Project: 10-0002(9) Christenson CB Sediment Sampling, F&BI 012027

#### QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF SOIL SAMPLES FOR SEMIVOLATILES BY EPA METHOD 8270D

Dorcont

	-		Percent	Percent		
	Reporting Units	Spike Level	Recovery	Recovery LCSD	Acceptance Criteria	RPD
Analyte			LCS			(Limit 20)
Phenol	mg/kg (ppm)	1.7	74	76	40-105	3
Bis(2-chloroethyl) ether	mg/kg (ppm)	1.7	80	85	32-144	6
2-Chlorophenol	mg/kg (ppm)	1.7	86	85	43-106	1
1,3-Dichlorobenzene	mg/kg (ppm)	1.7	82	84	52-116	2
1,4-Dichlorobenzene	mg/kg (ppm)	1.7	84	87	44-107	4
1,2-Dichlorobenzene	mg/kg (ppm)	1.7	78	82	54-113	5
Benzyl alcohol	mg/kg (ppm)	1.7	84	86	43-128	2
Bis(2-chloroisopropyl) ether	mg/kg (ppm)	1.7	84	84	51-115	0
2-Methylphenol	mg/kg (ppm)	1.7	58	57	49-102	2
Hexachloroethane	mg/kg (ppm)	1.7	84	87	48-117	4
N-Nitroso-di-n-propylamine	mg/kg (ppm)	1.7	84	89	36-116	6
3-Methylphenol + 4-Methylphenol	mg/kg (ppm)	1.7	76	77	70-130	1
Nitrobenzene	mg/kg (ppm)	1.7	86	83	50-117	4
Isophorone	mg/kg (ppm)	1.7	83	83	50-125	0
2-Nitrophenol	mg/kg (ppm)	1.7	97 81	100	53-104	3 2
2,4-Dimethylphenol	mg/kg (ppm)	1.7		83	30-103	2 9
Benzoic acid	mg/kg (ppm)	2.5	114 80	104 82	46-125	2
Bis(2-chloroethoxy)methane 2,4-Dichlorophenol	mg/kg (ppm)	1.7 1.7	80 85	82 87	54-116 53-102	2
1,2,4-Dichlorophenoi	mg/kg (ppm)		85 72			3
	mg/kg (ppm)	1.7		74	45-109	3 2
Naphthalene Hexachlorobutadiene	mg/kg (ppm)	1.7 1.7	86 81	88 85	42-116 53-110	2 5
4-Chloroaniline	mg/kg (ppm)	1.7	68	67	10-108	1
4-Chloro-3-methylphenol	mg/kg (ppm)	1.7	90	93	42-114	3
2-Methylnaphthalene	mg/kg (ppm) mg/kg (ppm)	1.7	75	76	39-139	1
Hexachlorocyclopentadiene	mg/kg (ppm)	1.7	73 77	76 79	35-121	3
2,4,6-Trichlorophenol	mg/kg (ppm)	1.7	91	91	35-121	0
2,4,5-Trichlorophenol	mg/kg (ppm)	1.7	94	99	51-111	5
2-Chloronaphthalene	mg/kg (ppm)	1.7	80	80	54-117	0
2-Nitroaniline	mg/kg (ppm)	1.7	88	94	53-118	7
Dimethyl phthalate	mg/kg (ppm)	1.7	88	91	48-123	3
Acenaphthylene	mg/kg (ppm)	1.7	80	81	52-118	1
2,6-Dinitrotoluene	mg/kg (ppm)	1.7	93	99	46-120	6
3-Nitroaniline	mg/kg (ppm)	1.7	52	50	11-93	4
Acenaphthene	mg/kg (ppm)	1.7	83	87	55-105	5
2,4-Dinitrophenol	mg/kg (ppm)	1.7	110	113	52-128	3
Dibenzofuran	mg/kg (ppm)	1.7	78	82	40-136	5
2,4-Dinitrotoluene	mg/kg (ppm)	1.7	89	93	43-115	4
4-Nitrophenol	mg/kg (ppm)	1.7	89	91	34-125	2
Diethyl phthalate	mg/kg (ppm)	1.7	86	91	51-121	6
Fluorene	mg/kg (ppm)	1.7	77	79	50-124	3
4-Chlorophenyl phenyl ether	mg/kg (ppm)	1.7	97	102	53-121	5
N-Nitrosodiphenylamine	mg/kg (ppm)	1.7	88	89	26-116	1
4-Nitroaniline	mg/kg (ppm)	1.7	85	80	19-178	6
4,6-Dinitro-2-methylphenol	mg/kg (ppm)	1.7	126	128	38-135	2
4-Bromophenyl phenyl ether	mg/kg (ppm)	1.7	89	90	52-115	1
Hexachlorobenzene	mg/kg (ppm)	1.7	88	88	40-119	0
Pentachlorophenol	mg/kg (ppm)	1.7	89	97	31-125	9
Phenanthrene	mg/kg (ppm)	1.7	88	90	48-121	2
Anthracene	mg/kg (ppm)	1.7	84	85	49-117	1
Carbazole	mg/kg (ppm)	1.7	88	90	31-164	2
Di-n-butyl phthalate	mg/kg (ppm)	1.7	87	90	52-118	3
Fluoranthene	mg/kg (ppm)	1.7	90	93	51-116	3
Pyrene	mg/kg (ppm)	1.7	92	94	39-113	2
Benzyl butyl phthalate	mg/kg (ppm)	1.7	98	99	37-135	1
Benz(a)anthracene	mg/kg (ppm)	1.7	87	90	48-117	3
Chrysene	mg/kg (ppm)	1.7	77	83	42-123	7
Bis(2-ethylhexyl) phthalate	mg/kg (ppm)	1.7	99	100	55-117	1
Di-n-octyl phthalate	mg/kg (ppm)	1.7	104	112	50-139	7
Benzo(a)pyrene	mg/kg (ppm)	1.7	91	95	44-113	4
Benzo(b)fluoranthene	mg/kg (ppm)	1.7	95	102	39-118	7
Benzo(k)fluoranthene	mg/kg (ppm)	1.7	113	108	39-154	5
Indeno(1,2,3-cd)pyrene	mg/kg (ppm)	1.7	93	99	39-136	6
Dibenz(a,h)anthracene	mg/kg (ppm)	1.7	48	58	42-133	19
Benzo(g,h,i)perylene	mg/kg (ppm)	1.7	64	72	42-139	12

#### **ENVIRONMENTAL CHEMISTS**

#### **Data Qualifiers & Definitions**

- a The analyte was detected at a level less than five times the reporting limit. The RPD results may not provide reliable information on the variability of the analysis.
- A1 More than one compound of similar molecule structure was identified with equal probability.
- b The analyte was spiked at a level that was less than five times that present in the sample. Matrix spike recoveries may not be meaningful.
- ca The calibration results for this range fell outside of acceptance criteria. The value reported is an estimate.
- c The presence of the analyte indicated may be due to carryover from previous sample injections.
- d The sample was diluted. Detection limits may be raised due to dilution.
- ds The sample was diluted. Detection limits are raised due to dilution and surrogate recoveries may not be meaningful.
- ${
  m d} {
  m v}$  Insufficient sample was available to achieve normal reporting limits and limits are raised accordingly.
- fb Analyte present in the blank and the sample.
- fc The compound is a common laboratory and field contaminant.
- hr The sample and duplicate were reextracted and reanalyzed. RPD results were still outside of control limits. The variability is attributed to sample inhomogeneity.
- ht Analysis performed outside the method or client-specified holding time requirement.
- ip Recovery fell outside of normal control limits. Compounds in the sample matrix interfered with the quantitation of the analyte.
- j The result is below normal reporting limits. The value reported is an estimate.
- J The internal standard associated with the analyte is out of control limits. The reported concentration is an estimate.
- jl The analyte result in the laboratory control sample is out of control limits. The reported concentration should be considered an estimate.
- jr The rpd result in laboratory control sample associated with the analyte is out of control limits. The reported concentration should be considered an estimate.
- js The surrogate associated with the analyte is out of control limits. The reported concentration should be considered an estimate.
- lc The presence of the compound indicated is likely due to laboratory contamination.
- L The reported concentration was generated from a library search.
- nm The analyte was not detected in one or more of the duplicate analyses. Therefore, calculation of the RPD is not applicable.
- pc The sample was received in a container not approved by the method. The value reported should be considered an estimate.
- pr The sample was received with incorrect preservation. The value reported should be considered an estimate.
- ve Estimated concentration calculated for an analyte response above the valid instrument calibration range. A dilution is required to obtain an accurate quantification of the analyte.
- vo The value reported fell outside the control limits established for this analyte.
- x The sample chromatographic pattern does not resemble the fuel standard used for quantitation.



Professional Analytical Services

#### **ANALYSIS REPORT**

Friedman & Bruya, Inc. 3012 16th Avenue West Seattle, WA 98119-2029 Attention: Michael Erdahl

Project #: 012027 PO Number: A-707

All results reported on a dry weight basis.

Date Received: 12/03/10 Date Reported: 10/10/11

**AMTEST Identification Number** 

10-A019321 **Client Identification** SED-CB-1-F120110 **Sampling Date** 12/01/10, 10:00

#### **Conventionals**

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANALYST	DATE
Total Solids	41.7	%		0.1	SM 2540G	NLN	12/07/10

#### **Demand**

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANALYST	DATE
Total Organic Carbon	5.8	%		0.05	SW 846 9060	NLN	12/20/10

#### **Grain Size Distribution**

PHI	OPENING (mm)	% RETENTION	FRACTION	PERCENT	METHOD	ANALYST	DATE
	4.75	8.60 %	GRAVEL	19.4	ASTM D422	МО	12/09/10
- 2	4.00	1.00 %			ASTM D422	МО	12/09/10
-1	2.00	9.80 %			ASTM D422	MO	12/09/10
0	1.00	9.70 %	SAND	65.0	ASTM D422	MO	12/09/10
+1	0.50	12.8 %			ASTM D422	МО	12/09/10
+ 2	0.25	15.9 %			ASTM D422	MO	12/09/10
+ 3	0.125	15.2 %			ASTM D422	МО	12/09/10
+ 4	0.063	11.4 %			ASTM D422	MO	12/09/10
+ 5	0.032	< 0.1 %	SILT	12.8	ASTM D422	МО	12/09/10
+ 6	0.016	6.90 %			ASTM D422	MO	12/09/10
+ 7	0.008	3.80 %			ASTM D422	МО	12/09/10
+ 8	0.004	2.10 %			ASTM D422	МО	12/09/10
+ 9	0.002	0.20 %	CLAY	2.70	ASTM D422	МО	12/09/10
+ 10	0.001	< 0.1 %			ASTM D422	МО	12/09/10
> + 10	< 0.001	2.50 %			ASTM D422	МО	12/09/10

Kathy Fugiel

President



Professional Analytical Services

#### **ANALYSIS REPORT**

Friedman & Bruya, Inc. 3012 16th Avenue West Seattle, WA 98119-2029 Attention: Michael Erdahl

Project #: 012027 PO Number: A-707

All results reported on a dry weight basis.

Date Received: 12/03/10 Date Reported: 10/10/11

**AMTEST Identification Number** 

10-A019322 **Client Identification** SED-CB-1-B120110 **Sampling Date** 12/01/10, 10:23

#### **Conventionals**

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANALYST	DATE
Total Solids	42.6	%		0.1	SM 2540G	NLN	12/07/10

#### **Demand**

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANALYST	DATE
Total Organic Carbon	7.4	%		0.05	SW 846 9060	NLN	12/20/10

#### **Grain Size Distribution**

PHI	OPENING (mm)	% RETENTION	FRACTION	PERCENT	METHOD	ANALYST	DATE
	4.75	< 0.1 %	GRAVEL	1.60	ASTM D422	MO	12/09/10
- 2	4.00	0.20 %			ASTM D422	MO	12/09/10
-1	2.00	1.40 %			ASTM D422	MO	12/09/10
0	1.00	4.00 %	SAND	79.2	ASTM D422	МО	12/09/10
+1	0.50	10.6 %			ASTM D422	MO	12/09/10
+ 2	0.25	18.8 %			ASTM D422	МО	12/09/10
+ 3	0.125	22.1 %			ASTM D422	MO	12/09/10
+ 4	0.063	23.7 %			ASTM D422	МО	12/09/10
+ 5	0.032	2.30 %	SILT	18.1	ASTM D422	МО	12/09/10
+ 6	0.016	8.50 %			ASTM D422	MO	12/09/10
+ 7	0.008	5.60 %			ASTM D422	MO	12/09/10
+ 8	0.004	1.70 %			ASTM D422	МО	12/09/10
+ 9	0.002	< 0.1 %	CLAY	1.20	ASTM D422	MO	12/09/10
+ 10	0.001	< 0.1 %			ASTM D422	MO	12/09/10
> + 10	< 0.001	1.20 %			ASTM D422	МО	12/09/10

Kathy Fugiel

President

#### **ENVIRONMENTAL CHEMISTS**

James E. Bruya, Ph.D. Yelena Aravkina, M.S. Bradley T. Benson, B.S. Kurt Johnson, B.S.

3012 16th Avenue West Seattle, WA 98119-2029 TEL: (206) 285-8282 e-mail: fbi@isomedia.com

November 28, 2011

Chris Wohlers, Project Manager Wohlers Environmental Services, Inc. 7440 S.W. Hunziker St., Suite C Tigard, OR 97223

Dear Mr. Wohlers:

Included are the results from the testing of material submitted on November 17, 2011 from the Christenson SW 11-0079(4), F&BI 111217 project. There are 21 pages included in this report. Any samples that may remain are currently scheduled for disposal in 30 days. If you would like us to return your samples or arrange for long term storage at our offices, please contact us as soon as possible.

We appreciate this opportunity to be of service to you and hope you will call if you should have any questions.

Sincerely,

FRIEDMAN & BRUYA, INC.

Michael Erdahl Project Manager

Enclosures

c: Kelly Branson, Evelyn Cummings

WOH1128R.DOC

### FRIEDMAN & BRUYA, INC. ENVIRONMENTAL CHEMISTS

#### CASE NARRATIVE

This case narrative encompasses samples received on November 17, 2011 by Friedman & Bruya, Inc. from the Wohlers Environmental Services Christenson SW 11-0079(4), F&BI 111217 project. Samples were logged in under the laboratory ID's listed below.

<u>Laboratory ID</u> <u>Wohlers Environmental Services</u>

111217-01 SW-OWS-EF-111611

Sample SW-OWS-EF-111611 was sent to Amtest for TOC analysis. Review of the enclosed report indicates that all quality assurance were acceptable.

The 8270D calibration standard failed the acceptance criteria for fluorene. In addition, the laboratory control sample and laboratory control sample duplicate failed below the acceptance criteria for fluorene. The data were flagged accordingly.

The 8270D N-nitrosodimethylamine laboratory control sample and laboratory control sample duplicate failed below the acceptance. The data were flagged accordingly.

The 8260C laboratory control sample and laboratory control sample duplicate failed the relative percent difference for benzoic acid. The analyte was not detected therefore the data were acceptable.

All other quality control requirements were acceptable.

#### **ENVIRONMENTAL CHEMISTS**

Date of Report: 11/28/11 Date Received: 11/17/11

Project: Christenson SW 11-0079(4), F&BI 111217

Date Extracted: 11/18/11 Date Analyzed: 11/18/11

#### RESULTS FROM THE ANALYSIS OF WATER SAMPLES FOR TOTAL PETROLEUM HYDROCARBONS AS GASOLINE USING METHOD NWTPH-Gx

Results Reported as ug/L (ppb)

Sample ID Laboratory ID	Gasoline Range	Surrogate ( <u>% Recovery</u> ) (Limit 51-134)
SW-OWS-EF-111611	<100	107
Method Blank	<100	107

#### **ENVIRONMENTAL CHEMISTS**

Date of Report: 11/28/11 Date Received: 11/17/11

Project: Christenson SW 11-0079(4), F&BI 111217

Date Extracted: 11/17/11 Date Analyzed: 11/17/11

# RESULTS FROM THE ANALYSIS OF WATER SAMPLES FOR TOTAL PETROLEUM HYDROCARBONS AS DIESEL AND MOTOR OIL USING METHOD NWTPH-Dx Sample Extracts Passed Through a Silica Gel Column Prior to Analysis

Results Reported as ug/L (ppb)

Sample ID Laboratory ID	Diesel Range (C <sub>10</sub> -C <sub>25</sub> )	Motor Oil Range (C <sub>25</sub> -C <sub>36</sub> )	Surrogate (% Recovery) (Limit 51-134)
SW-OWS-EF-111611	190 x	720	101
Method Blank	<50	<250	102

#### **ENVIRONMENTAL CHEMISTS**

#### Analysis For Total Metals By EPA Method 200.8

Client ID:	SW-OWS-EF-111611	Client:	Wohlers Environmental Services
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Date Received: 11/17/11 Project: Christenson SW 11-0079(4), F&BI 111217

Date Extracted: 11/18/11 Lab ID: 111217-01
Date Analyzed: 11/18/11 Data File: 111217-01.044
Matrix: Water Instrument: ICPMS1
Units: ug/L (ppb) Operator: AP

		Lower	Upper
Internal Standard:	% Recovery:	Limit:	Limit:
Germanium	109	60	125
Indium	106	60	125
Holmium	107	60	125

Analyte:	Concentration ug/L (ppb)
Chromium	<1
Nickel	1.28
Copper	5.04
Zinc	116

 Zinc
 116

 Arsenic
 <0.5 j</td>

 Selenium
 <1</td>

 Silver
 <0.1 j</td>

 Cadmium
 0.194 j

 Barium
 14.3

 Lead
 3.70

 Manganese
 20.1

#### **ENVIRONMENTAL CHEMISTS**

#### Analysis For Total Metals By EPA Method 200.8

Client ID: Method Blank Client: Wohlers Environmental Services

Date Received: NA Project: Christenson SW 11-0079(4), F&BI 111217

Date Extracted: 11/18/11 Lab ID: I1-798 mb
Date Analyzed: 11/18/11 Data File: I1-798 mb.046
Matrix: Water Instrument: ICPMS1
Units: ug/L (ppb) Operator: AP

		Lower	Upper
Internal Standard:	% Recovery:	Limit:	Limit:
Germanium	101	60	125
Indium	98	60	125
Holmium	101	60	125

Analyte:	Concentration ug/L (ppb)
Chromium	<1
Nickel	<1
Copper	<1
Zinc	<1
Arsenic	<0.5 j
Selenium	<1
Silver	<0.1 i

#### ENVIRONMENTAL CHEMISTS

Date of Report: 11/28/11 Date Received: 11/17/11

Project: Christenson SW 11-0079(4), F&BI 111217

Date Extracted: 11/17/11 Date Analyzed: 11/21/11

### RESULTS FROM THE ANALYSIS OF THE WATER SAMPLES FOR TOTAL MERCURY USING EPA METHOD 1631E

Results Reported as ug/L (ppb)

Sample ID	<u>Total Mercury</u>
Laboratory ID	_
SW-OWS-EF-111611 111217-01	<0.1
Method Blank	<0.1

#### ENVIRONMENTAL CHEMISTS

Date of Report: 11/28/11 Date Received: 11/17/11

Project: Christenson SW 11-0079(4), F&BI 111217

Date Extracted: 11/18/11 Date Analyzed: 11/18/11

#### RESULTS FROM THE ANALYSIS OF WATER SAMPLES FOR TOTAL SUSPENDED SOLIDS BY METHOD 2540D

Results Reported as mg/L (ppm)

Sample ID Laboratory ID	Total Suspended <u>Solids</u>
SW-OWS-EF-111611	14
Method Blank	<10

#### ENVIRONMENTAL CHEMISTS

#### Analysis For Semivolatile Compounds By EPA Method 8270D SIM

Client Sample ID: SW-OWS-EF-111611 Client: Wohlers Environmental Services

Date Received: 11/17/11 Project: Christenson SW 11-0079(4), F&BI 111217

Date Extracted:11/17/11Lab ID:111217-01Date Analyzed:11/18/11Data File:111816.DMatrix:WaterInstrument:GCMS6Units:ug/L (ppb)Operator:YA

		Lower	Upper
Surrogates:	% Recovery:	Limit:	Limit:
Anthracene-d10	95	50	150
Benzo(a)anthracene-d12	120	50	129

	Concentration
Compounds:	ug/L (ppb)
Naphthalene	< 0.05
Acenaphthylene	< 0.05
Acenaphthene	< 0.05
Fluorene	<0.05 ca, jl
Phenanthrene	< 0.05
Anthracene	< 0.05
Fluoranthene	0.057
Pyrene	0.061
Benz(a)anthracene	0.022
Chrysene	0.043
Benzo(a)pyrene	0.026
Benzo(b)fluoranthene	0.048
Benzo(k)fluoranthene	< 0.018
Indeno(1,2,3-cd)pyrene	0.031
Dibenz(a,h)anthracene	< 0.018
Benzo(g,h,i)perylene	< 0.05

#### **ENVIRONMENTAL CHEMISTS**

#### Analysis For Semivolatile Compounds By EPA Method 8270D SIM

Client Sample ID: Method Blank Client: Wohlers Environmental Services

Date Received: NA Project: Christenson SW 11-0079(4), F&BI 111217

Date Extracted:11/17/11Lab ID:01-2086 mbDate Analyzed:11/18/11Data File:111808.DMatrix:WaterInstrument:GCMS6Units:ug/L (ppb)Operator:YA

		Lower	Upper
Surrogates:	% Recovery:	Limit:	Limit:
Anthracene-d10	95	50	150
Benzo(a)anthracene-d12	108	50	129

	Concentration
Compounds:	ug/L (ppb)
Naphthalene	< 0.05
Acenaphthylene	< 0.05
Acenaphthene	< 0.05
Fluorene	<0.05 ca, jl
Phenanthrene	< 0.05
Anthracene	< 0.05
Fluoranthene	< 0.05
Pyrene	< 0.05
Benz(a)anthracene	< 0.018
Chrysene	< 0.018
Benzo(a)pyrene	< 0.018
Benzo(b)fluoranthene	< 0.018
Benzo(k)fluoranthene	< 0.018
Indeno(1,2,3-cd)pyrene	< 0.018
Dibenz(a,h)anthracene	< 0.018
Benzo(g,h,i)perylene	< 0.05
- ·	

#### ENVIRONMENTAL CHEMISTS

#### Analysis For Semivolatile Compounds By EPA Method 8270D

Client Sample ID:	SW-OWS-EF-111611	Client:	Wohlers Environmental Services
Date Received:	11/17/11	Project:	Christenson SW 11-0079(4), F&BI 111217
Date Extracted:	11/17/11	Lab ID:	111217-01
Date Analyzed:	11/19/11	Data File:	111818.D
Matrix:	Water	Instrument:	GCMS8
Units:	ug/L (ppb)	Operator:	YA

		Lower	Upper
Surrogates:	% Recovery:	Limit:	Limit:
2-Fluorophenol	55	32	162
Phenol-d6	38	10	170
Nitrobenzene-d5	84	50	150
2-Fluorobiphenyl	96	43	158
2,4,6-Tribromophenol	115	43	146
Terphenyl-d14	98	39	168

	Concentration		Concentration
Compounds:	ug/L (ppb)	Compounds:	ug/L (ppb)
Phenol	<5	2,4,6-Trichlorophenol	<1 j
Bis(2-chloroethyl) ether	<5	2,4,5-Trichlorophenol	<1 j
2-Chlorophenol	<1 j	2-Chloronaphthalene	< 0.5
1,3-Dichlorobenzene	< 0.5	2-Nitroaniline	< 0.5
1,4-Dichlorobenzene	< 0.5	Dimethyl phthalate	< 0.5
1,2-Dichlorobenzene	< 0.5	2,6-Dinitrotoluene	<0.1 j
Benzyl alcohol	<5	3-Nitroaniline	<1.5
Bis(2-chloroisopropyl) ether	<0.2 j	2,4-Dinitrophenol	<1 j
2-Methylphenol	<1 j	Dibenzofuran	< 0.5
Hexachloroethane	< 0.5	2,4-Dinitrotoluene	< 0.5
N-Nitroso-di-n-propylamine	<5	4-Nitrophenol	<1 j
3-Methylphenol + 4-Methylphen	ol <1 j	Diethyl phthalate	< 0.5
Nitrobenzene	< 0.5	4-Chlorophenyl phenyl ether	<0.2 j
Isophorone	< 0.5	N-Nitrosodiphenylamine	< 0.5
2-Nitrophenol	<1 j	4-Nitroaniline	<5
2,4-Dimethylphenol	<5	4,6-Dinitro-2-methylphenol	<1 j
Benzoic acid	<15 j	4-Bromophenyl phenyl ether	< 0.5
Bis(2-chloroethoxy)methane	< 0.5	Hexachlorobenzene	<0.2 j
2,4-Dichlorophenol	<1 j	Pentachlorophenol	<1 j
1,2,4-Trichlorobenzene	< 0.5	Carbazole	< 0.5
Hexachlorobutadiene	< 0.5	Di-n-butyl phthalate	< 0.5
4-Chloroaniline	<1.5	Benzyl butyl phthalate	< 0.5
4-Chloro-3-methylphenol	<1 j	Bis(2-ethylhexyl) phthalate	<5
2-Methylnaphthalene	< 0.5	Di-n-octyl phthalate	< 0.5
Hexachlorocyclopentadiene	<1.5	3,3-Dichlorobenzidine	<5
N-Nitrosodimethylamine	<0.2 j jl	2,3,4,6-Tetrachlorophenol	<50 L

#### ENVIRONMENTAL CHEMISTS

#### Analysis For Semivolatile Compounds By EPA Method 8270D

Client Sample ID:	Method Blank	Client:	Wohlers Environmental	Services
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Date Received: NA Project: Christenson SW 11-0079(4), F&BI 111217

Date Extracted:11/17/11Lab ID:01-2077 mb2Date Analyzed:11/18/11Data File:111810.DMatrix:WaterInstrument:GCMS8Units:ug/L (ppb)Operator:YA

		Lower	Upper
Surrogates:	% Recovery:	Limit:	Limit:
2-Fluorophenol	51	32	162
Phenol-d6	34	10	170
Nitrobenzene-d5	93	50	150
2-Fluorobiphenyl	97	43	158
2,4,6-Tribromophenol	93	43	146
Terphenyl-d14	100	39	168

	Concentration		Concentration
Compounds:	ug/L (ppb)	Compounds:	ug/L (ppb)
Phenol	<5	2,4,6-Trichlorophenol	<1 j
Bis(2-chloroethyl) ether	<5	2,4,5-Trichlorophenol	<1 j
2-Chlorophenol	<1 j	2-Chloronaphthalene	< 0.5
1,3-Dichlorobenzene	< 0.5	2-Nitroaniline	< 0.5
1,4-Dichlorobenzene	< 0.5	Dimethyl phthalate	< 0.5
1,2-Dichlorobenzene	< 0.5	2,6-Dinitrotoluene	<0.1 j
Benzyl alcohol	<5	3-Nitroaniline	<1.5
Bis(2-chloroisopropyl) ether	<0.2 j	2,4-Dinitrophenol	<1 j
2-Methylphenol	<1 j	Dibenzofuran	< 0.5
Hexachloroethane	< 0.5	2,4-Dinitrotoluene	< 0.5
N-Nitroso-di-n-propylamine	<5	4-Nitrophenol	<1 j
3-Methylphenol + 4-Methylphen	nol <1 j	Diethyl phthalate	< 0.5
Nitrobenzene	< 0.5	4-Chlorophenyl phenyl ether	<0.2 j
Isophorone	< 0.5	N-Nitrosodiphenylamine	< 0.5
2-Nitrophenol	<1 j	4-Nitroaniline	<5
2,4-Dimethylphenol	<5	4,6-Dinitro-2-methylphenol	<1 j
Benzoic acid	<15 j	4-Bromophenyl phenyl ether	< 0.5
Bis(2-chloroethoxy)methane	< 0.5	Hexachlorobenzene	<0.2 j
2,4-Dichlorophenol	<1 j	Pentachlorophenol	<1 j
1,2,4-Trichlorobenzene	< 0.5	Carbazole	< 0.5
Hexachlorobutadiene	< 0.5	Di-n-butyl phthalate	< 0.5
4-Chloroaniline	<1.5	Benzyl butyl phthalate	< 0.5
4-Chloro-3-methylphenol	<1 j	Bis(2-ethylhexyl) phthalate	<5
2-Methylnaphthalene	< 0.5	Di-n-octyl phthalate	< 0.5
Hexachlorocyclopentadiene	<1.5	3,3-Dichlorobenzidine	<5
N-Nitrosodimethylamine	<0.2 j jl	2,3,4,6-Tetrachlorophenol	<50 L

#### ENVIRONMENTAL CHEMISTS

Date of Report: 11/28/11 Date Received: 11/17/11

Project: Christenson SW 11-0079(4), F&BI 111217

Date Extracted: 11/18/11 Date Analyzed: 11/18/11

### RESULTS FROM THE ANALYSIS OF WATER SAMPLES FOR PCBs AS AROCLORS USING EPA METHOD 8082A

Results Reported as ug/L (ppb)

Sample ID Laboratory ID	Aroclo <u>1221</u>	or <u>1232</u>	<u>1016</u>	<u>1242</u>	<u>1248</u>	<u>1254</u>	<u>1260</u>	Surrogate (% Rec.) (Limit 42-147)
SW-OWS-EF-111611 111217-01 1/0.5	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	116
Method Blank 01-2090 MB 1/0.5	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	<0.05	70

#### ENVIRONMENTAL CHEMISTS

Date of Report: 11/28/11 Date Received: 11/17/11

Project: Christenson SW 11-0079(4), F&BI 111217

#### QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR TPH AS GASOLINE USING METHOD NWTPH-Gx

Laboratory Code: 111230-02 (Duplicate)

				Relative Percent
	Reporting	Sample	Duplicate	Difference
Analyte	Units	Result	Result	(Limit 20)
Gasoline	ug/L (ppb)	<100	<100	nm

			Percent	
	Reporting	Spike	Recovery	Acceptance
Analyte	Units	Level	LCS	Criteria
Gasoline	ug/L (ppb)	1,000	99	69-134

#### ENVIRONMENTAL CHEMISTS

Date of Report: 11/28/11 Date Received: 11/17/11

Project: Christenson SW 11-0079(4), F&BI 111217

### QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR TOTAL PETROLEUM HYDROCARBONS AS DIESEL EXTENDED USING METHOD NWTPH-Dx

Laboratory Code: Laboratory Control Sample Silica Gel

			Percent	Percent		
	Reporting	Spike	Recovery	Recovery	Acceptance	RPD
Analyte	Units	Level	LCS	LCSD	Criteria	(Limit 20)
Diesel Extended	ug/L (ppb)	2,500	94	92	58-134	2

#### ENVIRONMENTAL CHEMISTS

Date of Report: 11/28/11 Date Received: 11/17/11

Project: Christenson SW 11-0079(4), F&BI 111217

#### QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR TOTAL METALS USING EPA METHOD 200.8

Laboratory Code: 111230-18 (Matrix Spike)

				Percent	Percent		
	Reporting	Spike	Sample	Recovery	Recovery	Acceptance	RPD
Analyte	Units	Level	Result	MS	MSD	Criteria	(Limit 20)
Chromium	ug/L (ppb)	20	<1	86	84	67-132	2
Nickel	ug/L (ppb)	20	1.58	86	81	73-119	6
Copper	ug/L (ppb)	20	<1	85	80	50-144	6
Zinc	ug/L (ppb)	50	<1	87	83	46-148	5
Arsenic	ug/L (ppb)	10	1.10	112	107	56-167	5
Selenium	ug/L (ppb)	5	<1	108	104	54-170	4
Silver	ug/L (ppb)	5	<1	99	95	66-121	4
Cadmium	ug/L (ppb)	5	<1	109	101	86-118	8
Barium	ug/L (ppb)	50	286	154 b	96 b	63-133	46 b
Lead	ug/L (ppb)	10	<1	100	96	76-125	4
Manganese	ug/L (ppb)	20	4,700	718 b	0 b	50-150	200 b

J	J		Percent	
	Reporting	Spike	Recovery	Acceptance
Analyte	Units	Level	LCS	Criteria
Chromium	ug/L (ppb)	20	98	66-135
Nickel	ug/L (ppb)	20	100	67-134
Copper	ug/L (ppb)	20	101	66-134
Zinc	ug/L (ppb)	50	99	57-135
Arsenic	ug/L (ppb)	10	97	55-128
Selenium	ug/L (ppb)	5	96	59-134
Silver	ug/L (ppb)	5	100	64-136
Cadmium	ug/L (ppb)	5	99	66-135
Barium	ug/L (ppb)	50	98	66-133
Lead	ug/L (ppb)	10	100	67-135
Manganese	ug/L (ppb)	20	99	70-130

ENVIRONMENTAL CHEMISTS

Date of Report: 11/28/11 Date Received: 11/17/11

Project: Christenson SW 11-0079(4), F&BI 111217

#### QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR TOTAL MERCURY USING EPA METHOD 1631E

Laboratory Code: 111217-01 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result	Percent Recover y MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Mercury	ug/L (ppb)	0.5	<0.1	105	100	48-160	5

			Percent	
	Reporting	Spike	Recover	Acceptance
Analyte	Units	Level	y	Criteria
			LCS	
Mercury	ug/L (ppb)	0.5	105	79-126

#### ENVIRONMENTAL CHEMISTS

Date of Report: 11/28/11 Date Received: 11/17/11

Project: Christenson SW 11-0079(4), F&BI 111217

# QUALITY ASSURANCE RESULTS FROM THE ANALYSIS OF WATER SAMPLES FOR TOTAL SUSPENDED SOLIDS BY METHOD 2540D

			Percent	Percent		
	Reporting	Spike	Recovery	Recovery	Acceptance	RPD
Analyte	Units	Level	LCS	LCSD	Criteria	(Limit 20)
TSS	mg/L	50	74	73	61-131	1

#### **ENVIRONMENTAL CHEMISTS**

Date of Report: 11/28/11 Date Received: 11/17/11

Project: Christenson SW 11-0079(4), F&BI 111217

#### QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR PNA'S BY EPA METHOD 8270D SIM

			Percent	Percent		
	Reporting	Spike	Recovery	Recovery	Acceptance	RPD
Analyte	Units	Level	LCS	LCSD	Criteria	(Limit 20)
Naphthalene	ug/L (ppb)	1	81	79	64-100	2
Acenaphthylene	ug/L (ppb)	1	86	84	67-104	2
Acenaphthene	ug/L (ppb)	1	81	79	65-103	2
Fluorene	ug/L (ppb)	1	48 vo	40 vo	64-106	18
Phenanthrene	ug/L (ppb)	1	83	81	66-106	2
Anthracene	ug/L (ppb)	1	81	78	67-112	4
Fluoranthene	ug/L (ppb)	1	88	86	69-116	2
Pyrene	ug/L (ppb)	1	92	88	68-115	4
Benz(a)anthracene	ug/L (ppb)	1	83	80	59-100	4
Chrysene	ug/L (ppb)	1	88	84	66-103	5
Benzo(b)fluoranthene	ug/L (ppb)	1	92	89	59-114	3
Benzo(k)fluoranthene	ug/L (ppb)	1	91	85	55-111	7
Benzo(a)pyrene	ug/L (ppb)	1	89	86	54-111	3
Indeno(1,2,3-cd)pyrene	ug/L (ppb)	1	96	92	35-124	4
Dibenz(a,h)anthracene	ug/L (ppb)	1	92	86	35-116	7
Benzo(g,h,i)perylene	ug/L (ppb)	1	90	85	39-114	6

#### ENVIRONMENTAL CHEMISTS

Date of Report: 11/28/11 Date Received: 11/17/11

Project: Christenson SW 11-0079(4), F&BI 111217

#### QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR SEMIVOLATILES BY EPA METHOD 8270D

			Percent	Percent		
	Reporting	Spike	Recovery	Recovery	Acceptance	RPD
Analyte	Units	Level	LCS	LCSD	Criteria	(Limit 20)
N-Nitrosodimethylamine	ug/L (ppb)	50	27 vo	27 vo	70-130	0
Phenol	ug/L (ppb)	50	44	44	18-52	0
Bis(2-chloroethyl) ether	ug/L (ppb)	50	75	83	52-113	10
2-Chlorophenol	ug/L (ppb)	50	92	90	50-110	2
1,3-Dichlorobenzene	ug/L (ppb)	50	92	90	45-109	2
1,4-Dichlorobenzene	ug/L (ppb)	50	99	98	44-118	1
1,2-Dichlorobenzene	ug/L (ppb)	50	99	97	46-116	2
Benzyl alcohol	ug/L (ppb)	50	81	83	42-100	2
Bis(2-chloroisopropyl) ether	ug/L (ppb)	50	78	85	51-124	9
2-Methylphenol	ug/L (ppb)	50	82	80	38-100	2
Hexachloroethane	ug/L (ppb)	50	102	94	42-117	8
N-Nitroso-di-n-propylamine	ug/L (ppb)	50	103	97	48-124	6
3-Methylphenol + 4-Methylphenol	ug/L (ppb)	50	84	76	48-87	10
Nitrobenzene	ug/L (ppb)	50	96	95	50-118	1
Isophorone	ug/L (ppb)	50	100	99	55-116	1
2-Nitrophenol	ug/L (ppb)	50	97	95	42-127	2
2,4-Dimethylphenol	ug/L (ppb)	50	85	83	45-100	2
Benzoic acid	ug/L (ppb)	75	12	9 vo	10-46	29 vo
	ug/L (ppb)	50	100	98	55-115	2
Bis(2-chloroethoxy)methane	ug/L (ppb)	50	98	97	55-113	1
2,4-Dichlorophenol		50	94	93	50-109	1
1,2,4-Trichlorobenzene	ug/L (ppb) ug/L (ppb)	50	99	97	50-109	2
Hexachlorobutadiene		100	56	54	34-85	4
4-Chloroaniline	ug/L (ppb)					2
4-Chloro-3-methylphenol	ug/L (ppb)	50	100	98	54-114	2
2-Methylnaphthalene	ug/L (ppb)	50	101	99	53-113	
Hexachlorocyclopentadiene	ug/L (ppb)	50	66	60	26-94	10
2,4,6-Trichlorophenol	ug/L (ppb)	50	91	89	46-114	2
2,4,5-Trichlorophenol	ug/L (ppb)	50	112	110	57-122	2
2-Chloronaphthalene	ug/L (ppb)	50	103	101	52-112	2
2-Nitroaniline	ug/L (ppb)	50	94	93	47-128	1
Dimethyl phthalate	ug/L (ppb)	50	102	101	55-116	1
2,6-Dinitrotoluene	ug/L (ppb)	50	100	98	49-126	2
3-Nitroaniline	ug/L (ppb)	100	61	63	32-89	3
2,4-Dinitrophenol	ug/L (ppb)	50	83	83	29-130	0
Dibenzofuran	ug/L (ppb)	50	100	99	53-113	1
2,4-Dinitrotoluene	ug/L (ppb)	50	103	102	48-129	1
4-Nitrophenol	ug/L (ppb)	50	47	49	12-59	4
Diethyl phthalate	ug/L (ppb)	50	103	100	55-116	3
4-Chlorophenyl phenyl ether	ug/L (ppb)	50	102	100	52-115	2
N-Nitrosodiphenylamine	ug/L (ppb)	50	98	101	51-112	3
4-Nitroaniline	ug/L (ppb)	100	69	75	42-115	8
4,6-Dinitro-2-methylphenol	ug/L (ppb)	50	96	102	40-128	6
4-Bromophenyl phenyl ether	ug/L (ppb)	50	105	103	53-114	2
Hexachlorobenzene	ug/L (ppb)	50	106	106	54-115	0
Pentachlorophenol	ug/L (ppb)	50	102	103	49-114	1
Carbazole	ug/L (ppb)	50	91	89	54-115	2
Di-n-butyl phthalate	ug/L (ppb)	50	105	100	54-115	5
Pyrene	ug/L (ppb)	50	109	105	54-121	4
Benzyl butyl phthalate	ug/L (ppb)	50	115	106	53-122	8
3,3'-Dichlorobenzidine	ug/L (ppb)	75	62	62	62-84	0
Bis(2-ethylhexyl) phthalate	ug/L (ppb)	50	111	100	54-122	10

#### **ENVIRONMENTAL CHEMISTS**

Date of Report: 11/28/11 Date Received: 11/17/11

Project: Christenson SW 11-0079(4), F&BI 111217

# QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR POLYCHLORINATED BIPHENYLS AS AROCLOR 1016/1260 BY EPA METHOD 8082A

	Reporting	Spike	% Recovery	% Recovery	Acceptance	RPD
Analyte	Units	Level	LCS	LCSD	Criteria	(Limit 20)
Aroclor 1016	ug/L (ppb)	0.8	81	99	48-139	19
Aroclor 1260	ug/L (ppb)	0.8	105	109	50-142	4

#### **ENVIRONMENTAL CHEMISTS**

#### **Data Qualifiers & Definitions**

- $\boldsymbol{a}$  The analyte was detected at a level less than five times the reporting limit. The RPD results may not provide reliable information on the variability of the analysis.
- A1 More than one compound of similar molecule structure was identified with equal probability.
- b The analyte was spiked at a level that was less than five times that present in the sample. Matrix spike recoveries may not be meaningful.
- ca The calibration results for this range fell outside of acceptance criteria. The value reported is an estimate.
- c The presence of the analyte indicated may be due to carryover from previous sample injections.
- d The sample was diluted. Detection limits may be raised due to dilution.
- ds The sample was diluted. Detection limits are raised due to dilution and surrogate recoveries may not be meaningful.
- $\mbox{d} v$  Insufficient sample was available to achieve normal reporting limits and limits are raised accordingly.
- fb Analyte present in the blank and the sample.
- fc The compound is a common laboratory and field contaminant.
- hr The sample and duplicate were reextracted and reanalyzed. RPD results were still outside of control limits. The variability is attributed to sample inhomogeneity.
- ht Analysis performed outside the method or client-specified holding time requirement.
- ip Recovery fell outside of normal control limits. Compounds in the sample matrix interfered with the quantitation of the analyte.
- j The result is below normal reporting limits. The value reported is an estimate.
- J The internal standard associated with the analyte is out of control limits. The reported concentration is an estimate.
- ${
  m jl}$  The analyte result in the laboratory control sample is out of control limits. The reported concentration should be considered an estimate.
- jr The rpd result in laboratory control sample associated with the analyte is out of control limits. The reported concentration should be considered an estimate.
- js The surrogate associated with the analyte is out of control limits. The reported concentration should be considered an estimate.
- lc The presence of the compound indicated is likely due to laboratory contamination.
- L The reported concentration was generated from a library search.
- nm The analyte was not detected in one or more of the duplicate analyses. Therefore, calculation of the RPD is not applicable.
- pc The sample was received in a container not approved by the method. The value reported should be considered an estimate.
- pr The sample was received with incorrect preservation. The value reported should be considered an estimate.
- ve Estimated concentration calculated for an analyte response above the valid instrument calibration range. A dilution is required to obtain an accurate quantification of the analyte.
- vo The value reported fell outside the control limits established for this analyte.
- x The sample chromatographic pattern does not resemble the fuel standard used for quantitation.



Am Test Inc. 13600 NE 126TH PL Suite C Kirkland, WA 98034 (425) 885-1664 Professional Analytical Services

Nov 22 2011 Friedman & Bruya, Inc. 3012 16th Avenue West Seattle, WA 98119-2029 Attention: Michael Erdahl

Dear Michael Erdahl:

Enclosed please find the analytical data for your 111217 project.

The following is a cross correlation of client and laboratory identifications for your convenience.

CLIENT ID	MATRIX	AMTEST ID	TEST
SW-OWS-EFF-111611	Water	11-A016942	DEM

Your sample was received on Friday, November 18, 2011. At the time of receipt, the sample was logged in and properly maintained prior to the subsequent analysis.

The analytical procedures used at AmTest are well documented and are typically derived from the protocols of the EPA, USDA, FDA or the Army Corps of Engineers.

Following the analytical data you will find the Quality Control (QC) results.

Please note that the detection limits that are listed in the body of the report refer to the Method Detection Limits (MDL's), as opposed to Practical Quantitation Limits (PQL's).

If you should have any questions pertaining to the data package, please feel free to conact me.

Sincerely,

Aaron W. Young Laboratory Manager

Project #: B-413 PO Number: B-413

BACT = Bacteriological CONV = Conventionals

MET = Metals ORG = Organics NUT=Nutrients DEM=Demand MIN=Minerals



Professional Analytical Services

#### **ANALYSIS REPORT**

Friedman & Bruya, Inc. 3012 16th Avenue West Seattle, WA 98119-2029 Attention: Michael Erdahl

Project Name: 111217 Project #: B-413 PO Number: B-413

All results reported on an as received basis.

Date Received: 11/18/11 Date Reported: 11/22/11

AMTEST Identification Number 11-A016942

Client Identification SW-OWS-EFF-111611 Sampling Date 11/16/11, 08:30

#### **Demand**

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANALYST	DATE
Total Organic Carbon	3.5	mg/l		0.50	SM 5310B	NLN	11/19/11

Aaron W. Young Laboratory Manager



Professional Analytical Services

QC Summary for sample number: 11-A016942

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SAMPLE#	ANALYTE	UNITS	SAMPLE VALUE	DUP VALUE	RPD
11-A016970	Total Organic Carbon	mg/l	93.	93.	0.00

#### **MATRIX SPIKES**

SAMPLE#	ANALYTE	UNITS	SAMPLE VALUE	SMPL+ SPK	SPK AMT	RECOVERY
11-A016970	Total Organic Carbon	mg/l	93.	140	50.	94.00 %

#### **STANDARD REFERENCE MATERIALS**

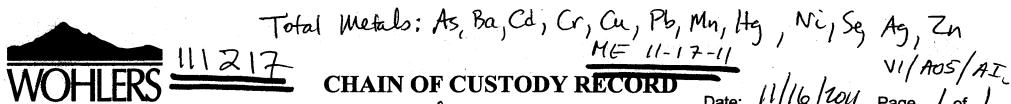
ANALYTE	UNITS	TRUE VALUE	MEASURED VALUE	RECOVERY
Total Organic Carbon	mg/l	50.	50.	100. %

#### **BLANKS**

ANALYTE	UNITS	RESULT
Total Organic Carbon	mg/l	< 0.5

#### - SAMPI OF CHAT SUBCONTRACT SAMPLE CHAIN OF CUSTODY

Send Report To N	Michael	l Erdahl		SUB	CONTR	ACTE	R A	mles	+						Page	#  NAROUNI	of [		
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City, State, ZIP_S	City, State, ZIP_Seattle, WA 98119  Phone #_ (206) 285-8282				REMARKS  Please Email Results  merdahl@friedmanandbruya.com									SAMPLE DISPOSAL  Dispose after 30 days Return samples Will call with instructions					
								Ť	ANAL	YSES	REC	QUES	TED	13	1	1			
Sample ID	Lab ID	Date Sampled	Time Sampled	Matrix	# of jars	Oil and Grease	ЕРН	VPH	Nitrate	Sulfate	Alkalinity	Total Openic	Toki Cyanide	who Cymide	Amenalle	Lyenid 1	Votes		
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Ph. (206) 285-8282 Fax (206) 283-5044		Received by:	7						4										



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ENVIRONMENTAL SERVICES, INC.					$\sqrt{}$							Da	ite: _	111	16	10	<u>u</u>	Pag	e/	_ of _	
7440 S.W. Hunziker Street, Suite C Tigard, OR 97223		P	roject Name	e:(	Venten	Son	&i	<u>J</u>		···		PO 1	No. /	Proje	ct No	s[	-0	) O	190	4	)
Phone: (503) 670-1344 Fax: (503) 670-1701		P	roject Mana	ager:							20.0			iv							
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#### **ENVIRONMENTAL CHEMISTS**

James E. Bruya, Ph.D. Yelena Aravkina, M.S. Bradley T. Benson, B.S. Kurt Johnson, B.S.

3012 16th Avenue West Seattle, WA 98119-2029 TEL: (206) 285-8282 e-mail: fbi@isomedia.com

February 10, 2012

Chris Wohlers, Project Manager Wohlers Environmental Services, Inc. 7440 S.W. Hunziker St., Suite C Tigard, OR 97223

Dear Mr. Wohlers:

Included are the results from the testing of material submitted on January 31, 2012 from the Christenson SW, PO 11-0079(4), F&BI 201314 project. There are 21 pages included in this report. Any samples that may remain are currently scheduled for disposal in 30 days. If you would like us to return your samples or arrange for long term storage at our offices, please contact us as soon as possible.

We appreciate this opportunity to be of service to you and hope you will call if you should have any questions.

Sincerely,

FRIEDMAN & BRUYA, INC.

Michael Erdahl Project Manager

Enclosures

c: Kelly Branson, Evelyn Cummings, Greg Lish

WOH0210R.DOC

### FRIEDMAN & BRUYA, INC. ENVIRONMENTAL CHEMISTS

#### CASE NARRATIVE

This case narrative encompasses samples received on January 31, 2012 by Friedman & Bruya, Inc. from the Wohlers Environmental Services Christenson SW, PO 11-0079(4), F&BI 201314 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID Wohlers Environmental Services

201314-01 SW-OWS-EF-012912

Sample SW-OWS-EF-012912 was sent to Aquatic Research for total organic carbon analysis. Review of the enclosed report indicates that all quality assurance were acceptable.

Several compounds in the 8270D laboratory control sample and laboratory control sample duplicate failed the acceptance criteria. The data were flagged accordingly.

All other quality control requirements were acceptable.

#### **ENVIRONMENTAL CHEMISTS**

Date of Report: 02/10/12 Date Received: 01/31/12

Project: Christenson SW, PO 11-0079(4), F&BI 201314

Date Extracted: 01/31/12 Date Analyzed: 01/31/12

#### RESULTS FROM THE ANALYSIS OF WATER SAMPLES FOR TOTAL PETROLEUM HYDROCARBONS AS GASOLINE USING METHOD NWTPH-Gx

Results Reported as ug/L (ppb)

Sample ID Laboratory ID	Gasoline Range	Surrogate ( <u>% Recovery)</u> (Limit 51-134)
SW-OWS-EF-012912 201314-01	<100	98
Method Blank 02-0155 MB	<100	100

#### **ENVIRONMENTAL CHEMISTS**

Date of Report: 02/10/12 Date Received: 01/31/12

Project: Christenson SW, PO 11-0079(4), F&BI 201314

Date Extracted: 01/31/12 Date Analyzed: 02/02/12

# RESULTS FROM THE ANALYSIS OF WATER SAMPLES FOR TOTAL PETROLEUM HYDROCARBONS AS DIESEL AND MOTOR OIL USING METHOD NWTPH-Dx Sample Extracts Passed Through a Silica Gel Column Prior to Analysis

Results Reported as ug/L (ppb)

<u>Sample ID</u> Laboratory ID	<u>Diesel Range</u> (C <sub>10</sub> -C <sub>25</sub> )	Motor Oil Range (C25-C36)	Surrogate (% Recovery) (Limit 50-150)
SW-OWS-EF-012912 201314-01	53 x	<250	106
Method Blank 02-150 MB	<50	<250	90

#### ENVIRONMENTAL CHEMISTS

#### Analysis For Total Metals By EPA Method 200.8

Client ID: SW-OWS-EF-012912 Client: Wohlers Environmental Services

Date Received: 01/31/12 Project: Christenson SW, PO 11-0079(4), F&BI 201314

Date Extracted:02/01/12Lab ID:201314-01Date Analyzed:02/01/12Data File:201314-01.011Matrix:WaterInstrument:ICPMS1Units:ug/L (ppb)Operator:AP

		Lower	Upper
Internal Standard:	% Recovery:	Limit:	Limit:
Germanium	94	60	125
Indium	94	60	125
Holmium	97	60	125

Analyte:	Concentration ug/L (ppb)
Chromium	1.20
Nickel	<1
Copper	3.28
Zinc	121
Arsenic	<0.5 j
Selenium	<1
Silver	<0.1 j
Cadmium	0.213 j
Barium	15.2
Lead	2.29
Manganese	18.9

#### **ENVIRONMENTAL CHEMISTS**

#### Analysis For Total Metals By EPA Method 200.8

Client ID: Method Blank Client: Wohlers Environmental Services

Date Received: NA Project: Christenson SW, PO 11-0079(4), F&BI 201314

Date Extracted:02/01/12Lab ID:I2-81 mbDate Analyzed:02/01/12Data File:I2-81 mb.009Matrix:WaterInstrument:ICPMS1Units:ug/L (ppb)Operator:AP

		Lower	Upper
Internal Standard:	% Recovery:	Limit:	Limit:
Germanium	97	60	125
Indium	97	60	125
Holmium	98	60	125

< 0.1 j

<1

Analyte:	Concentration ug/L (ppb)
Chromium	<1
Nickel	<1
Copper	<1
Zinc	<1
Arsenic	<0.5 j
Selenium	<1
Silver	<0.1 j
Cadmium	<0.1 j
Barium	<1

Lead

Manganese

#### ENVIRONMENTAL CHEMISTS

Date of Report: 02/10/12 Date Received: 01/31/12

Project: Christenson SW, PO 11-0079(4), F&BI 201314

Date Extracted: 02/01/12 Date Analyzed: 02/03/12

## RESULTS FROM THE ANALYSIS OF THE WATER SAMPLES FOR TOTAL MERCURY USING EPA METHOD 1631E

Results Reported as ug/L (ppb)

Sample ID	<u>Total Mercury</u>
Laboratory ID	-
SW-OWS-EF-012912 201314-01	<0.1
Method Blank	<0.1

#### ENVIRONMENTAL CHEMISTS

#### Analysis For Semivolatile Compounds By EPA Method 8270D

Client Sample ID: Date Received: 201314	SW-OWS-E 01/31/12	F-012912	Client: Project:		Invironmental Services on SW, PO 11-0079(4), F&BI
Date Extracted:	01/31/12		Lab ID:	201314-01	
Date Analyzed:	02/07/12		Data File:	020708.D	
Matrix:	Water		Instrument:	GCMS8	
Units:	ug/L (ppb)		Operator:	YA	
			Lower		Upper
Surrogates:		% Recovery:	Limit:		Limit:

		Lower	Opper
Surrogates:	% Recovery:	Limit:	Limit:
2-Fluorophenol	49	32	162
Phenol-d6	31	10	170
Nitrobenzene-d5	80	50	150
2-Fluorobiphenyl	80	43	158
2,4,6-Tribromophenol	81	43	146
Terphenyl-d14	95	39	168

	Concentration		Concentration
Compounds:	ug/L (ppb)	Compounds:	ug/L (ppb)
Phenol	<5	2,4,6-Trichlorophenol	<1 j
Bis(2-chloroethyl) ether	<5	2,4,5-Trichlorophenol	<1 j
2-Chlorophenol	<1 j	2-Chloronaphthalene	< 0.5
1,3-Dichlorobenzene	< 0.5	2-Nitroaniline	< 0.5
1,4-Dichlorobenzene	< 0.5	Dimethyl phthalate	< 0.5
1,2-Dichlorobenzene	< 0.5	2,6-Dinitrotoluene	<0.1 j
Benzyl alcohol	<5	3-Nitroaniline	<1.5
Bis(2-chloroisopropyl) ether	<0.2 j	2,4-Dinitrophenol	<1 j
2-Methylphenol	<1 j	Dibenzofuran	< 0.5
Hexachloroethane	< 0.5	2,4-Dinitrotoluene	< 0.5
N-Nitroso-di-n-propylamine	<5	4-Nitrophenol	<1 j
3-Methylphenol + 4-Methylphe	enol <1 j	Diethyl phthalate	< 0.5
Nitrobenzene	< 0.5	4-Chlorophenyl phenyl ether	<0.2 j
Isophorone	< 0.5	N-Nitrosodiphenylamine	< 0.5
2-Nitrophenol	<1 j	4-Nitroaniline	<5
2,4-Dimethylphenol	<5 jl	4,6-Dinitro-2-methylphenol	<1 j
Benzoic acid	<15 j	4-Bromophenyl phenyl ether	< 0.5
Bis(2-chloroethoxy)methane	< 0.5	Hexachlorobenzene	<0.2 j
2,4-Dichlorophenol	<1 j	Pentachlorophenol	<1 j
1,2,4-Trichlorobenzene	< 0.5	Carbazole	< 0.5
Hexachlorobutadiene	< 0.5	Di-n-butyl phthalate	< 0.5
4-Chloroaniline	<1.5	Benzyl butyl phthalate	< 0.5
4-Chloro-3-methylphenol	<1 j	Bis(2-ethylhexyl) phthalate	<5
2-Methylnaphthalene	< 0.5	Di-n-octyl phthalate	< 0.5
Hexachlorocyclopentadiene	<1.5 jl	3,3-Dichlorobenzidine	<2 j jl
N-Nitrosodimethylamine	<5 L	2,3,4,6-Tetrachlorophenol	<50 L

#### ENVIRONMENTAL CHEMISTS

#### Analysis For Semivolatile Compounds By EPA Method 8270D

Client Sample ID:	Method Blank	Client:	Wohlers Environmental Services
Date Received:	NA	Project:	Christenson SW, PO 11-0079(4), F&BI
201314			
Date Extracted:	01/31/12	Lab ID:	02-0152 mb
Date Analyzed:	02/07/12	Data File:	020706.D
Matrix:	Water	Instrument:	GCMS8
Units:	ug/L (ppb)	Operator:	YA

		Lower	∪pper
Surrogates:	% Recovery:	Limit:	Limit:
2-Fluorophenol	32	32	162
Phenol-d6	23	10	170
Nitrobenzene-d5	67	50	150
2-Fluorobiphenyl	68	43	158
2,4,6-Tribromophenol	48	43	146
Terphenyl-d14	72	39	168

	Concentration		Concentration
Compounds:	ug/L (ppb)	Compounds:	ug/L (ppb)
Phenol	<5	2,4,6-Trichlorophenol	<1 j
Bis(2-chloroethyl) ether	<5	2,4,5-Trichlorophenol	<1 j
2-Chlorophenol	<1 j	2-Chloronaphthalene	< 0.5
1,3-Dichlorobenzene	< 0.5	2-Nitroaniline	< 0.5
1,4-Dichlorobenzene	< 0.5	Dimethyl phthalate	< 0.5
1,2-Dichlorobenzene	< 0.5	2,6-Dinitrotoluene	<0.1 j
Benzyl alcohol	<5	3-Nitroaniline	<1.5
Bis(2-chloroisopropyl) ether	<0.2 j	2,4-Dinitrophenol	<1 j
2-Methylphenol	<1 j	Dibenzofuran	< 0.5
Hexachloroethane	< 0.5	2,4-Dinitrotoluene	< 0.5
N-Nitroso-di-n-propylamine	<5	4-Nitrophenol	<1 j
3-Methylphenol + 4-Methylphe	nol <1 j	Diethyl phthalate	< 0.5
Nitrobenzene	< 0.5	4-Chlorophenyl phenyl ether	<0.2 j
Isophorone	< 0.5	N-Nitrosodiphenylamine	< 0.5
2-Nitrophenol	<1 j	4-Nitroaniline	<5
2,4-Dimethylphenol	<5 jl	4,6-Dinitro-2-methylphenol	<1 j
Benzoic acid	<15 j	4-Bromophenyl phenyl ether	< 0.5
Bis(2-chloroethoxy)methane	< 0.5	Hexachlorobenzene	<0.2 j
2,4-Dichlorophenol	<1 j	Pentachlorophenol	<1 j
1,2,4-Trichlorobenzene	< 0.5	Carbazole	< 0.5
Hexachlorobutadiene	< 0.5	Di-n-butyl phthalate	< 0.5
4-Chloroaniline	<1.5	Benzyl butyl phthalate	< 0.5
4-Chloro-3-methylphenol	<1 j	Bis(2-ethylhexyl) phthalate	<5
2-Methylnaphthalene	< 0.5	Di-n-octyl phthalate	< 0.5
Hexachlorocyclopentadiene	<1.5 jl	3,3-Dichlorobenzidine	<2 j jl
N-Nitrosodimethylamine	<5 L	2,3,4,6-Tetrachlorophenol	<50 L

#### ENVIRONMENTAL CHEMISTS

#### Analysis For Semivolatile Compounds By EPA Method 8270D SIM

Client Sample ID:	SW-OWS-EF-012912	Client:	Wohlers Environmental Services
Date Received:	01/31/12	Project:	Christenson SW, PO 11-0079(4), F&BI

201314

Date Extracted:01/31/12Lab ID:201314-01Date Analyzed:02/01/12Data File:020110.DMatrix:WaterInstrument:GCMS6Units:ug/L (ppb)Operator:YA

		Lower	Upper
Surrogates:	% Recovery:	Limit:	Limit:
Anthracene-d10	<b>7</b> 5	50	150
Benzo(a)anthracene-d12	92	50	129

, ,	
Compounds:	Concentration ug/L (ppb)
Naphthalene	< 0.05
Acenaphthylene	< 0.05
Acenaphthene	< 0.05
Fluorene	< 0.05
Phenanthrene	< 0.05
Anthracene	< 0.05
Fluoranthene	< 0.05
Pyrene	< 0.05
Benz(a)anthracene	< 0.018
Chrysene	< 0.018
Benzo(a)pyrene	< 0.018
Benzo(b)fluoranthene	< 0.018
Benzo(k)fluoranthene	< 0.018
Indeno(1,2,3-cd)pyrene	< 0.018
Dibenz(a,h)anthracene	< 0.018
Benzo(g,h,i)perylene	< 0.05

#### **ENVIRONMENTAL CHEMISTS**

#### Analysis For Semivolatile Compounds By EPA Method 8270D SIM

Client Sample ID: Method Blank Client: Wohlers Environmental Services Christenson SW, PO 11-0079(4), F&BI

Date Received: Project: NA

201314

Date Extracted: 01/31/12 Lab ID: 02-0151 mb 02/01/12 Data File: 020105.D Date Analyzed: Matrix: Water Instrument: GCMS6 Units: ug/L (ppb) Operator: YA

Lower Upper Surrogates: % Recovery: Limit: Limit: Anthracene-d10 93 50 150 Benzo(a)anthracene-d12 102 50 129

Concentration

Compounds: ug/L (ppb) Naphthalene < 0.05 Acenaphthylene < 0.05 Acenaphthene < 0.05 Fluorene < 0.05 Phenanthrene < 0.05 Anthracene < 0.05 Fluoranthene < 0.05 Pyrene < 0.05 Benz(a)anthracene < 0.018 Chrysene < 0.018 Benzo(a)pyrene < 0.018 Benzo(b)fluoranthene < 0.018 Benzo(k)fluoranthene < 0.018 Indeno(1,2,3-cd)pyrene < 0.018 Dibenz(a,h)anthracene < 0.018 Benzo(g,h,i)perylene < 0.05

#### **ENVIRONMENTAL CHEMISTS**

Date of Report: 02/10/12 Date Received: 01/31/12

Project: Christenson SW, PO 11-0079(4), F&BI 201314

Date Extracted: NA Date Analyzed: 02/02/12

#### RESULTS FROM THE ANALYSIS OF WATER SAMPLES FOR TOTAL SUSPENDED SOLIDS BY METHOD 2540D

Results Reported as mg/L (ppm)

Sample ID Laboratory ID	Total Suspended <u>Solids</u>
SW-OWS-EF-012912 201314-01	<10
Method Blank	<10

#### ENVIRONMENTAL CHEMISTS

Date of Report: 02/10/12 Date Received: 01/31/12

Project: Christenson SW, PO 11-0079(4), F&BI 201314

Date Extracted: 01/31/12 Date Analyzed: 02/03/12

## RESULTS FROM THE ANALYSIS OF WATER SAMPLES FOR PCBs AS AROCLORS USING EPA METHOD 8082A

Results Reported as ug/L (ppb)

Sample ID Laboratory ID	Aroclo <u>1221</u>	or <u>1232</u>	<u>1016</u>	<u>1242</u>	<u>1248</u>	<u>1254</u>	<u>1260</u>	Surrogate (% Rec.) (Limit 42-147)
SW-OWS-EF-012912 201314-01	< 0.05	<0.05	<0.05	<0.05	<0.05	< 0.05	<0.05	76
Method Blank 02-154 MB	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	97

#### ENVIRONMENTAL CHEMISTS

Date of Report: 02/10/12 Date Received: 01/31/12

Project: Christenson SW, PO 11-0079(4), F&BI 201314

## QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR TPH AS GASOLINE USING METHOD NWTPH-Gx

Laboratory Code: 201313-01 (Duplicate)

				Relative Percent
	Reporting	Sample	Duplicate	Difference
Analyte	Units	Result	Result	(Limit 20)
Gasoline	ug/L (ppb)	<100	<100	nm

		Percent				
	Reporting	Spike	Recovery	Acceptance		
Analyte	Units	Level	LCS	Criteria		
Gasoline	ug/L (ppb)	1,000	106	69-134		

#### ENVIRONMENTAL CHEMISTS

Date of Report: 02/10/12 Date Received: 01/31/12

Project: Christenson SW, PO 11-0079(4), F&BI 201314

## QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR TOTAL PETROLEUM HYDROCARBONS AS DIESEL EXTENDED USING METHOD NWTPH-Dx

Laboratory Code: Laboratory Control Sample Silica Gel

			Percent	Percent		
	Reporting	Spike	Recovery	Recovery	Acceptance	RPD
Analyte	Units	Level	LCS	LCSD	Criteria	(Limit 20)
Diesel Extended	ug/L (ppb)	2,500	97	110	61-133	13

#### ENVIRONMENTAL CHEMISTS

Date of Report: 02/10/12 Date Received: 01/31/12

Project: Christenson SW, PO 11-0079(4), F&BI 201314

#### QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR TOTAL METALS USING EPA METHOD 200.8

Laboratory Code: 201314-01 (Matrix Spike)

				Percent	Percent		
	Reporting	Spike	Sample	Recovery	Recovery	Acceptance	RPD
Analyte	Units	Level	Result	MS	MSD	Criteria	(Limit 20)
Chromium	ug/L (ppb)	20	1.20	102	102	67-132	0
Nickel	ug/L (ppb)	20	<1	102	103	73-119	1
Copper	ug/L (ppb)	20	3.28	101	101	50-144	0
Zinc	ug/L (ppb)	50	121	97 b	93 b	46-148	4 b
Arsenic	ug/L (ppb)	10	< 0.5	101	101	56-167	0
Selenium	ug/L (ppb)	5	<1	100	100	54-170	0
Silver	ug/L (ppb)	5	< 0.1	102	101	66-121	1
Cadmium	ug/L (ppb)	5	0.213	104	103	86-118	1
Barium	ug/L (ppb)	50	15.2	101 b	100 b	63-133	1 b
Lead	ug/L (ppb)	10	2.29	106 b	102 b	76-125	4 b
Manganese	ug/L (ppb)	20	18.9	103 b	100 b	50-150	3 b

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	Reporting	Spike	Recovery	Acceptance
Analyte	Units	Level	LCS	Criteria
Chromium	ug/L (ppb)	20	97	66-135
Nickel	ug/L (ppb)	20	98	67-134
Copper	ug/L (ppb)	20	101	66-134
Zinc	ug/L (ppb)	50	98	57-135
Arsenic	ug/L (ppb)	10	100	55-128
Selenium	ug/L (ppb)	5	98	59-134
Silver	ug/L (ppb)	5	99	64-136
Cadmium	ug/L (ppb)	5	101	66-135
Barium	ug/L (ppb)	50	98	66-133
Lead	ug/L (ppb)	10	99	67-135
Manganese	ug/L (ppb)	20	102	70-130

#### ENVIRONMENTAL CHEMISTS

Date of Report: 02/10/12 Date Received: 01/31/12

Project: Christenson SW, PO 11-0079(4), F&BI 201314

#### QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR TOTAL MERCURY USING EPA METHOD 1631E

Laboratory Code: 201314-01 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result	Percent Recover y MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Mercury	ug/L (ppb)	0.5	< 0.1	98	100	48-160	2

			Percent	
	Reporting	Spike	Recover	Acceptance
Analyte	Units	Level	y	Criteria
			LCS	
Mercury	ug/L (ppb)	0.5	102	79-126

#### **ENVIRONMENTAL CHEMISTS**

Date of Report: 02/10/12 Date Received: 01/31/12

Project: Christenson SW, PO 11-0079(4), F&BI 201314

#### QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR SEMIVOLATILES BY EPA METHOD 8270D

3	Control Samp	ic	Percent	Percent		
	Reporting	Spike	Recovery	Recovery	Acceptance	RPD
Analyte	Units	Level	LCS	LCSD	Criteria	(Limit 20)
Phenol	ug/L (ppb)	50	29	26	18-52	11
Bis(2-chloroethyl) ether	ug/L (ppb)	50	68	60	52-113	12
2-Chlorophenol	ug/L (ppb)	50	65	58	50-110	11
1,3-Dichlorobenzene	ug/L (ppb)	50	65	60	45-109	8
1,4-Dichlorobenzene	ug/L (ppb)	50	66	61	44-118	8
1.2-Dichlorobenzene	ug/L (ppb)	50	67	60	46-116	11
Benzyl alcohol	ug/L (ppb)	50	60	55	42-100	9
Bis(2-chloroisopropyl) ether	ug/L (ppb)	50	74	67	51-124	10
2-Methylphenol	ug/L (ppb)	50	56	51	38-100	9
Hexachloroethane	ug/L (ppb)	50	66	60	42-117	10
N-Nitroso-di-n-propylamine	ug/L (ppb)	50	70	64	48-124	9
3-Methylphenol + 4-Methylphenol	ug/L (ppb)	50	53	49	48-87	8
Nitrobenzene	ug/L (ppb)	50	72	64	50-118	12
Isophorone	ug/L (ppb)	50	77	71	55-116	8
2-Nitrophenol	ug/L (ppb)	50	71	64	42-127	10
2,4-Dimethylphenol	ug/L (ppb)	50	45	43 vo	45-100	5
Benzoic acid	ug/L (ppb)	75	24	19	10-46	23 vo
Bis(2-chloroethoxy)methane	ug/L (ppb)	50	74	68	55-115	8
2,4-Dichlorophenol	ug/L (ppb)	50	69	63	55-113	9
1,2,4-Trichlorobenzene	ug/L (ppb)	50	64	58	50-109	10
Hexachlorobutadiene	ug/L (ppb)	50	65	59	50-109	10
	ug/L (ppb) ug/L (ppb)	100	60	55	34-85	9
4-Chloroaniline		50	70	64	54-114	9
4-Chloro-3-methylphenol	ug/L (ppb)	50	70 72	66		9
2-Methylnaphthalene	ug/L (ppb)	50 50	72 27	22 vo	53-113 26-94	20
Hexachlorocyclopentadiene	ug/L (ppb)		72			
2,4,6-Trichlorophenol	ug/L (ppb)	50		61	46-114	17
2,4,5-Trichlorophenol	ug/L (ppb)	50	73	64	57-122	13
2-Chloronaphthalene	ug/L (ppb)	50	73	64	52-112	13
2-Nitroaniline	ug/L (ppb)	50	76	66	47-128	14
Dimethyl phthalate	ug/L (ppb)	50	77	68	55-116	12
2,6-Dinitrotoluene	ug/L (ppb)	50	76	67	49-126	13
3-Nitroaniline	ug/L (ppb)	100	63	56	32-89	12
2,4-Dinitrophenol	ug/L (ppb)	50	70	63	29-130	11
Dibenzofuran	ug/L (ppb)	50	74	65	53-113	13
2,4-Dinitrotoluene	ug/L (ppb)	50	79	68	48-129	15
4-Nitrophenol	ug/L (ppb)	50	36	31	12-59	15
Diethyl phthalate	ug/L (ppb)	50	74	65	55-116	13
4-Chlorophenyl phenyl ether	ug/L (ppb)	50	75	66	52-115	13
N-Nitrosodiphenylamine	ug/L (ppb)	50	73	65	51-112	12
4-Nitroaniline	ug/L (ppb)	100	70	62	42-115	12
4,6-Dinitro-2-methylphenol	ug/L (ppb)	50	76	67	40-128	13
4-Bromophenyl phenyl ether	ug/L (ppb)	50	73	66	53-114	10
Hexachlorobenzene	ug/L (ppb)	50	71	63	54-115	12
Pentachlorophenol	ug/L (ppb)	50	68	58	49-114	16
Carbazole	ug/L (ppb)	50	71	63	54-115	12
Di-n-butyl phthalate	ug/L (ppb)	50	74	66	54-115	11
Benzyl butyl phthalate	ug/L (ppb)	50	76	68	53-122	11
Bis(2-ethylhexyl) phthalate	ug/L (ppb)	50	75	64	54-122	16
Di-n-octyl phthalate	ug/L (ppb)	50	75	68	50-131	10
3,3-Dichlorobenzidine	ug/L (ppb)	50	67	56 vo	50-131	19

#### **ENVIRONMENTAL CHEMISTS**

Date of Report: 02/10/12 Date Received: 01/31/12

Project: Christenson SW, PO 11-0079(4), F&BI 201314

#### QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR PNA'S BY EPA METHOD 8270D SIM

·	-	_	Percent	Percent		
	Reporting	Spike	Recovery	Recovery	Acceptance	RPD
Analyte	Units	Level	LCS	LCSD	Criteria	(Limit 20)
Naphthalene	ug/L (ppb)	1	80	84	64-100	5
Acenaphthylene	ug/L (ppb)	1	85	86	67-104	1
Acenaphthene	ug/L (ppb)	1	81	85	65-103	5
Fluorene	ug/L (ppb)	1	80	94	64-106	16
Phenanthrene	ug/L (ppb)	1	84	89	66-106	6
Anthracene	ug/L (ppb)	1	84	86	67-112	2
Fluoranthene	ug/L (ppb)	1	89	92	69-116	3
Pyrene	ug/L (ppb)	1	92	93	68-115	1
Benz(a)anthracene	ug/L (ppb)	1	83	85	59-100	2
Chrysene	ug/L (ppb)	1	89	92	66-103	3
Benzo(b)fluoranthene	ug/L (ppb)	1	85	88	59-114	3
Benzo(k)fluoranthene	ug/L (ppb)	1	86	88	55-111	2
Benzo(a)pyrene	ug/L (ppb)	1	87	87	54-111	0
Indeno(1,2,3-cd)pyrene	ug/L (ppb)	1	98	99	35-124	1
Dibenz(a,h)anthracene	ug/L (ppb)	1	87	89	35-116	2
Benzo(g,h,i)perylene	ug/L (ppb)	1	87	89	39-114	2

#### **ENVIRONMENTAL CHEMISTS**

Date of Report: 02/10/12 Date Received: 01/31/12

Project: Christenson SW, PO 11-0079(4), F&BI 201314

## QUALITY ASSURANCE RESULTS FROM THE ANALYSIS OF WATER SAMPLES FOR TOTAL SUSPENDED SOLIDS BY METHOD 2540D

-	_		Percent	Percent		
	Reporting	Spike	Recovery	Recovery	Acceptance	RPD
Analyte	Units	Level	LCS	LCSD	Criteria	(Limit 20)
TSS	mg/L	50	76	85	61-131	11

#### **ENVIRONMENTAL CHEMISTS**

Date of Report: 02/10/12 Date Received: 01/31/12

Project: Christenson SW, PO 11-0079(4), F&BI 201314

## QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR POLYCHLORINATED BIPHENYLS AS AROCLOR 1016/1260 BY EPA METHOD 8082A

	Reporting	Spike	% Recovery	% Recovery	Acceptance	RPD
Analyte	Units	Level	LCS	LCSD	Criteria	(Limit 20)
Aroclor 1016	ug/L (ppb)	1.0	88	105	48-139	18
Aroclor 1260	ug/L (ppb)	1.0	91	101	50-142	10

#### **ENVIRONMENTAL CHEMISTS**

#### **Data Qualifiers & Definitions**

- a The analyte was detected at a level less than five times the reporting limit. The RPD results may not provide reliable information on the variability of the analysis.
- A1 More than one compound of similar molecule structure was identified with equal probability.
- b The analyte was spiked at a level that was less than five times that present in the sample. Matrix spike recoveries may not be meaningful.
- ca The calibration results for this range fell outside of acceptance criteria. The value reported is an estimate.
- c The presence of the analyte indicated may be due to carryover from previous sample injections.
- d The sample was diluted. Detection limits may be raised due to dilution.
- ds The sample was diluted. Detection limits are raised due to dilution and surrogate recoveries may not be meaningful.
- $\mbox{d} v$  Insufficient sample was available to achieve normal reporting limits and limits are raised accordingly.
- fb Analyte present in the blank and the sample.
- fc The compound is a common laboratory and field contaminant.
- hr The sample and duplicate were reextracted and reanalyzed. RPD results were still outside of control limits. The variability is attributed to sample inhomogeneity.
- ht Analysis performed outside the method or client-specified holding time requirement.
- ip Recovery fell outside of normal control limits. Compounds in the sample matrix interfered with the quantitation of the analyte.
- j The result is below normal reporting limits. The value reported is an estimate.
- J The internal standard associated with the analyte is out of control limits. The reported concentration is an estimate.
- jl The analyte result in the laboratory control sample is out of control limits. The reported concentration should be considered an estimate.
- jr The rpd result in laboratory control sample associated with the analyte is out of control limits. The reported concentration should be considered an estimate.
- js The surrogate associated with the analyte is out of control limits. The reported concentration should be considered an estimate.
- lc The presence of the compound indicated is likely due to laboratory contamination.
- L The reported concentration was generated from a library search.
- nm The analyte was not detected in one or more of the duplicate analyses. Therefore, calculation of the RPD is not applicable.
- pc The sample was received in a container not approved by the method. The value reported should be considered an estimate.
- $\operatorname{pr}$  The sample was received with incorrect preservation. The value reported should be considered an estimate.
- ve Estimated concentration calculated for an analyte response above the valid instrument calibration range. A dilution is required to obtain an accurate quantification of the analyte.
- vo The value reported fell outside the control limits established for this analyte.
- x The sample chromatographic pattern does not resemble the fuel standard used for quantitation.



#### AQUATIC RESEARCH INCORPORATED

#### LABORATORY & CONSULTING SERVICES

 ${\bf 3927}~{\bf AURORA}~{\bf AVENUE}~{\bf NORTH}, {\bf SEATTLE}, {\bf WA}~{\bf 98103}$ 

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:

FBI009-34

PAGE 1

REPORT DATE: DATE SAMPLED:

02/07/12

01/29/12

**DATE RECEIVED:** 

01/31/12

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER

SAMPLES FROM FRIEDMAN & BRUYA, INC. / PROJECT NO. 201314

#### CASE NARRATIVE

One water sample was received by the laboratory in good condition and analyzed according to the chain of custody. No difficulties were encountered in the preparation or analysis of this sample. Sample data follows while QA/QC data is contained on subsequent pages.

#### SAMPLE DATA

SIMILED DITTIL	_
	TOC
SAMPLE ID	(mg/L)
SW-OWS-EF-012912	1.27



#### AQUATIC RESEARCH INCORPORATED

#### LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103 PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:

FBI009-34

PAGE 2

REPORT DATE:

02/07/12

DATE SAMPLED:

01/29/12

**DATE RECEIVED:** 

01/31/12

FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER

SAMPLES FROM FRIEDMAN & BRUYA, INC. / PROJECT NO. 201314

#### QA/QC DATA

QC PARAMETER	TOC
	(mg/L)
METHOD	SM205310B
DATE ANALYZED	02/01/12
DETECTION LIMIT	0.250
DUPLICATE	
SAMPLE ID	BATCH
ORIGINAL	4.27
DUPLICATE	4.19
RPD	1.94%
SPIKE SAMPLE	
SAMPLE ID	BATCH
ORIGINAL	4.27
SPIKED SAMPLE	8.96
SPIKE ADDED	4.50
% RECOVERY	104.24%
QC CHECK	
FOUND	4.06
TRUE	4.00
% RECOVERY	101.48%
BLANK	< 0.250

RPD = RELATIVE PERCENT DIFFERENCE.

NA = NOT APPLICABLE OR NOT AVAILABLE.

anie Hederto.

NC = NOT CALCULABLE DUE TO ONE OR MORE VALUES BEING BELOW THE DETECTION LIMIT. OR = RECOVERY NOT CALCULABLE DUE TO SPIKE SAMPLE OUT OF RANGE OR SPIKE TOO LOW RELATIVE TO SAMPLE CONCENTRATION.

SUBMITTED BY:

Damien Gadomski Project Manager

A GREEKAROB!".

#### SUBCONTRACT SAMPLE CHAIN OF CUSTODY

Y	12/2017
	Page#of
	TURNAROUND TIME
PO#	Standard (2 Weeks)
539	Rush charges authorized by:
	SAMPLE DISPOSAL
	☐ Dispose after 30 days
	☐ Return samples

☐ Will call with instructions

FRIDDG 34

Send Report To Michael Erdahl	SUBCONTRACTER Agustic R	Agutic Research				
Company Friedman and Bruya, Inc.	PROJECT NAME/NO.	PO#				
Address 3012 16th Ave W	201314	B-539				
City, State, ZIP_Seattle, WA 98119	REMARKS					
Phone # (206) 285-8282 Fax # (206) 283-5044	Please Email Result  merdahl@friedmanandbru					

	<u> </u>					1			ANAI	YSE	SREG	UES	TED			
Sample ID	Lab ID	Date Sampled	Time Sampled	Matrix	# of jars	Oil and Grease	ЕРН	VРН	Nitrate	Sulfate	Alkalinity	TOC	·			Notes
SW-OWS-EF-012912		1/24/12	1015	water	1							×				
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Friedman & Bruya, Inc. 3012 16th Avenue West
Seattle, WA 98119-2029
Ph. (206) 285-8282
Fax (206) 283-5044

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:	Michael Erdahl	Friedman & Bruya	1/31/12	lizoAM.
Received by:	S-MIGISON	MUX	1/21/12	1400
Relimquished by:	i		1	
Received by:				



Total Metals: As, Ba, Cd, Cr, Gu, Pb, Mu, Hg, Ni, Se, As, Zn

CHAIN OF CUSTODY RECORD

ME 01-31-12

AI 3/VI /E04

Date: 1/29/12 Page tor t Project Name: Christensan Sw PO No. / Project No. 11-0079 (Y) 7440 S.W. Hunziker Street, Suite C Tigard, OR 97223 Laboratory CW Phone: (503) 670-1344 Project Manager: \_\_\_\_ Fax: (503) 670-1701 Job No. SVOCS ( Phinaletes TURNAROUND: RUSH: **RBDM VOC - EPA 8260** of Containers 3-5 Day: \_\_\_\_/ 7-10 Day: \_\_\_/ 24-Hour BTEX - EPA 8020m Dissolved Lead NWTPH-HCID Special Instructions: See altached NWTPH-Gx NWTPH-Dx HOLD MDLS (MRLS + analytical Welhords Lab ID Sample ID Time | Matrix 1.5W-OWS-EF-0/29/2/129/12 01 A-N 8. 9. 10. 11. 12. 13. Samples received at 14. 15. Received By Laboratory: Relinquished By: Date: Received By: Relinquished By: Date: 01-31-12 Sign: \_\_ Sign: Sign: 9. 10 Print: DO Print: Print: Wohlers Environmental Company: Company:

#### **ENVIRONMENTAL CHEMISTS**

James E. Bruya, Ph.D. Yelena Aravkina, M.S. Bradley T. Benson, B.S. Kurt Johnson, B.S. 3012 16th Avenue West Seattle, WA 98119-2029 TEL: (206) 285-8282 e-mail: fbi@isomedia.com

April 6, 2012

Chris Wohlers, Project Manager Wohlers Environmental Services, Inc. 7440 S.W. Hunziker St., Suite C Tigard, OR 97223

Dear Mr. Wohlers:

Included are the amended results from the testing of material submitted on March 6, 2012 from the Christensen SW 11-0079(4), F&BI 203061 project. Per your request, the sample ID has been corrected.

We appreciate this opportunity to be of service to you and hope you will call if you should have any questions.

Sincerely,

FRIEDMAN & BRUYA, INC.

Michael Erdahl Project Manager

Enclosures

c: Kelly Branson, Evelyn Cummings

WOH0320R.DOC

#### **ENVIRONMENTAL CHEMISTS**

James E. Bruya, Ph.D. Yelena Aravkina, M.S. Bradley T. Benson, B.S. Kurt Johnson, B.S. 3012 16th Avenue West Seattle, WA 98119-2029 TEL: (206) 285-8282 e-mail: fbi@isomedia.com

March 20, 2012

Chris Wohlers, Project Manager Wohlers Environmental Services, Inc. 7440 S.W. Hunziker St., Suite C Tigard, OR 97223

Dear Mr. Wohlers:

Included are the results from the testing of material submitted on March 6, 2012 from the Christensen SW 11-0079(4), F&BI 203061 project. There are 21 pages included in this report. Any samples that may remain are currently scheduled for disposal in 30 days. If you would like us to return your samples or arrange for long term storage at our offices, please contact us as soon as possible.

We appreciate this opportunity to be of service to you and hope you will call if you should have any questions.

Sincerely,

FRIEDMAN & BRUYA, INC.

Michael Erdahl Project Manager

**Enclosures** 

c: Kelly Branson, Evelyn Cummings WOH0320R.DOC

### FRIEDMAN & BRUYA, INC. ENVIRONMENTAL CHEMISTS

#### CASE NARRATIVE

This case narrative encompasses samples received on March 6, 2012 by Friedman & Bruya, Inc. from the Wohlers Environmental Services Christensen SW 11-0079(4), F&BI 203061 project. Samples were logged in under the laboratory ID's listed below.

<u>Laboratory ID</u> <u>Wohlers Environmental Services</u>

203061-01 SW-OWS-EF-030512

Sample SW-OWS-EF-030512 was sent to Amtest for TOC analysis. Review of the enclosed report indicates that all quality assurance were acceptable.

Chrysene in the laboratory control sample duplicate failed the acceptance criteria. The data were flagged accordingly.

All other quality control requirements were acceptable.

#### **ENVIRONMENTAL CHEMISTS**

Date of Report: 03/20/12 Date Received: 03/06/12

Project: Christensen SW 11-0079(4), F&BI 203061

Date Extracted: 03/06/12 Date Analyzed: 03/06/12

#### RESULTS FROM THE ANALYSIS OF WATER SAMPLES FOR TOTAL PETROLEUM HYDROCARBONS AS GASOLINE USING METHOD NWTPH-Gx

Results Reported as ug/L (ppb)

Sample ID Laboratory ID	Gasoline Range	Surrogate ( <u>% Recovery)</u> (Limit 51-134)
SW-OWS-EF-030512 203061-01	<100	101
Method Blank 02-0352 MB	<100	98

#### **ENVIRONMENTAL CHEMISTS**

Date of Report: 03/20/12 Date Received: 03/06/12

Project: Christensen SW 11-0079(4), F&BI 203061

Date Extracted: 03/07/12 Date Analyzed: 03/09/12

# RESULTS FROM THE ANALYSIS OF WATER SAMPLES FOR TOTAL PETROLEUM HYDROCARBONS AS DIESEL AND MOTOR OIL USING METHOD NWTPH-Dx Sample Extracts Passed Through a Silica Gel Column Prior to Analysis

Results Reported as ug/L (ppb)

<u>Sample ID</u> Laboratory ID	<u>Diesel Range</u> (C <sub>10</sub> -C <sub>25</sub> )	Motor Oil Range (C25-C36)	Surrogate (% Recovery) (Limit 50-150)
SW-OWS-EF-030512 203061-01	<50	<250	86
Method Blank 02-356 MB2	< 50	<250	79

#### **ENVIRONMENTAL CHEMISTS**

#### Analysis For Total Metals By EPA Method 200.8

Client ID: SW-OWS-EF-030512 Client: Wohlers Environmental Services

Date Received: 03/06/12 Project: Christensen SW 11-0079(4), F&BI 203061

 Date Extracted:
 03/08/12
 Lab ID:
 203061-01

 Date Analyzed:
 03/13/12
 Data File:
 203061-01.016

 Matrix:
 Water
 Instrument:
 ICPMS1

 Units:
 ug/L (ppb)
 Operator:
 AP

		Lower	Upper
Internal Standard:	% Recovery:	Limit:	Limit:
Germanium	92	60	125
Indium	96	60	125
Holmium	98	60	125

Analyte:	Concentration ug/L (ppb)
Chromium	1.33
Nickel	<1
Copper	4.12
Zinc	111
Arsenic	<0.5 j
Selenium	<1
Silver	<0.1 j
Cadmium	0.159 j
Barium	27.0
Lead	2.36
Manganese	22.8

#### **ENVIRONMENTAL CHEMISTS**

#### Analysis For Total Metals By EPA Method 200.8

Client ID: Method Blank Client: Wohlers Environmental Services

Date Received: NA Project: Christensen SW 11-0079(4), F&BI 203061

Date Extracted:03/08/12Lab ID:I2-158 mbDate Analyzed:03/13/12Data File:I2-158 mb.015Matrix:WaterInstrument:ICPMS1Units:ug/L (ppb)Operator:AP

		Lower	Upper
Internal Standard:	% Recovery:	Limit:	Limit:
Germanium	92	60	125
Indium	99	60	125
Holmium	100	60	125

Analyte:	Concentration ug/L (ppb)
Chromium	<1
Nickel	<1
Copper	<1
Zinc	<1
Arsenic	<0.5 j
Selenium	<1
Silver	<0.1 j
Cadmium	<0.1 j
Barium	<1
Lead	<0.1 j
Manganese	<1

#### ENVIRONMENTAL CHEMISTS

Date of Report: 03/20/12 Date Received: 03/06/12

Project: Christensen SW 11-0079(4), F&BI 203061

Date Extracted: 03/06/12 Date Analyzed: 03/09/12

# RESULTS FROM THE ANALYSIS OF THE WATER SAMPLES FOR TOTAL MERCURY USING EPA METHOD 1631E

Results Reported as ug/L (ppb)

Sample ID	<u>Total Mercury</u>
Laboratory ID	·
SW-OWS-EF-030512	< 0.1
203061-01	
	0.4
Method Blank	< 0.1

#### ENVIRONMENTAL CHEMISTS

Date of Report: 03/20/12 Date Received: 03/06/12

Project: Christensen SW 11-0079(4), F&BI 203061

Date Extracted: 03/08/12 Date Analyzed: 03/08/12

#### RESULTS FROM THE ANALYSIS OF WATER SAMPLES FOR TOTAL SUSPENDED SOLIDS BY METHOD 2540D

Results Reported as mg/L (ppm)

Sample ID Laboratory ID	Total Suspended <u>Solids</u>
SW-OWS-EF-030512 203061-01	<10
Method Blank	<10

#### ENVIRONMENTAL CHEMISTS

#### Analysis For Semivolatile Compounds By EPA Method 8270D SIM

Client Sample ID: SW-OWS-EF	-030512 Client:	Wohlers Environmental Services
-----------------------------	-----------------	--------------------------------

Date Received: 03/06/12 Christensen SW 11-0079(4), F&BI 203061

Project: Lab ID: Date Extracted: 03/08/12 203061-01 Date Analyzed: 03/09/12 Data File: 030908.D Matrix: Water Instrument: GCMS6 ug/L (ppb) Units: Operator: YA

		Lower	Upper
Surrogates:	% Recovery:	Limit:	Limit:
Anthracene-d10	94	50	150
Benzo(a)anthracene-d12	103	50	129

Compounds:	Concentration ug/L (ppb)
Naphthalene	< 0.05
Acenaphthylene	< 0.05
Acenaphthene	< 0.05
Fluorene	< 0.05
Phenanthrene	< 0.05
Anthracene	< 0.05
Fluoranthene	0.055
Pyrene	0.084
Benz(a)anthracene	0.021
Chrysene	0.030 jl
Benzo(a)pyrene	0.025
Benzo(b)fluoranthene	0.033
Benzo(k)fluoranthene	< 0.018
Indeno(1,2,3-cd)pyrene	0.033
Dibenz(a,h)anthracene	< 0.018
Benzo(g,h,i)perylene	< 0.05

#### **ENVIRONMENTAL CHEMISTS**

#### Analysis For Semivolatile Compounds By EPA Method 8270D SIM

Client Sample ID: Method Blank Client: Wohlers Environmental Services

Date Received: NA Project: Christensen SW 11-0079(4), F&BI 203061

Date Extracted:03/08/12Lab ID:02-0381 mbDate Analyzed:03/09/12Data File:030906.DMatrix:WaterInstrument:GCMS6Units:ug/L (ppb)Operator:YA

		Lower	Upper
Surrogates:	% Recovery:	Limit:	Limit:
Anthracene-d10	97	50	150
Benzo(a)anthracene-d12	94	50	129

Compounds:	Concentration ug/L (ppb)
Naphthalene	< 0.05
Acenaphthylene	< 0.05
Acenaphthene	< 0.05
Fluorene	< 0.05
Phenanthrene	< 0.05
Anthracene	< 0.05
Fluoranthene	< 0.05
Pyrene	< 0.18
Benz(a)anthracene	< 0.018
Chrysene	< 0.018
Benzo(a)pyrene	< 0.018
Benzo(b)fluoranthene	< 0.018
Benzo(k)fluoranthene	< 0.018
Indeno(1,2,3-cd)pyrene	< 0.018
Dibenz(a,h)anthracene	< 0.018
Benzo(g,h,i)perylene	< 0.05

#### ENVIRONMENTAL CHEMISTS

### Analysis For Semivolatile Compounds By EPA Method 8270D

Client Sample ID:	SW-OWS-EF-030512	Client:	Wohlers Environmental Services
Date Received:	03/06/12	Project:	Christensen SW 11-0079(4), F&BI 203061
Date Extracted:	03/08/12	Lab ID:	203061-01
Date Analyzed:	03/13/12	Data File:	031309.D
Matrix:	Water	Instrument:	GCMS8
Units:	ug/L (ppb)	Operator:	YA

		Lower	∪pper
Surrogates:	% Recovery:	Limit:	Limit:
2-Fluorophenol	59	32	162
Phenol-d6	38	10	170
Nitrobenzene-d5	105	50	150
2-Fluorobiphenyl	98	43	158
2,4,6-Tribromophenol	109	43	146
Terphenyl-d14	95	39	168

	Concentration		Concentration
Compounds:	ug/L (ppb)	Compounds:	ug/L (ppb)
Phenol	<5	2,4,6-Trichlorophenol	<1 j
Bis(2-chloroethyl) ether	<5	2,4,5-Trichlorophenol	<1 j
2-Chlorophenol	<1 j	2-Chloronaphthalene	< 0.5
1,3-Dichlorobenzene	< 0.5	2-Nitroaniline	< 0.5
1,4-Dichlorobenzene	< 0.5	Dimethyl phthalate	< 0.5
1,2-Dichlorobenzene	< 0.5	2,6-Dinitrotoluene	<0.1 j
Benzyl alcohol	<5	3-Nitroaniline	<1.5
Bis(2-chloroisopropyl) ether	<0.2 j	2,4-Dinitrophenol	<1 j
2-Methylphenol	<1 j	Dibenzofuran	< 0.5
Hexachloroethane	< 0.5	2,4-Dinitrotoluene	< 0.5
N-Nitroso-di-n-propylamine	<5	4-Nitrophenol	<1 j
3-Methylphenol + 4-Methylpher	nol <1 j	Diethyl phthalate	0.53 fc
Nitrobenzene	< 0.5	4-Chlorophenyl phenyl ether	<0.2 j
Isophorone	< 0.5	N-Nitrosodiphenylamine	< 0.5
2-Nitrophenol	<1 j	4-Nitroaniline	<5
2,4-Dimethylphenol	<5	4,6-Dinitro-2-methylphenol	<1 j
Benzoic acid	<15 j	4-Bromophenyl phenyl ether	< 0.5
Bis(2-chloroethoxy)methane	< 0.5	Hexachlorobenzene	<0.2 j
2,4-Dichlorophenol	<1 j	Pentachlorophenol	<1 j
1,2,4-Trichlorobenzene	< 0.5	Carbazole	< 0.5
Hexachlorobutadiene	< 0.5	Di-n-butyl phthalate	< 0.5
4-Chloroaniline	<1.5	Benzyl butyl phthalate	< 0.5
4-Chloro-3-methylphenol	<1 j	Bis(2-ethylhexyl) phthalate	<5
2-Methylnaphthalene	< 0.5	Di-n-octyl phthalate	< 0.5
Hexachlorocyclopentadiene	<1.5	3,3'-Dichlorobenzidine	<2 j
N-Nitrosodimethylamine	<5 jl	2,3,4,6-Tetrachlorophenol	<50 L

#### ENVIRONMENTAL CHEMISTS

#### Analysis For Semivolatile Compounds By EPA Method 8270D

Client Sample ID:	Method Blank	Client:	Wohlers Environmental Services
Date Received:	NA	Project:	Christensen SW 11-0079(4), F&BI 203061

Date Extracted:03/08/12Lab ID:02-380 mbDate Analyzed:03/09/12Data File:030911.DMatrix:WaterInstrument:GCMS8Units:ug/L (ppb)Operator:YA

		Lower	Upper
Surrogates:	% Recovery:	Limit:	Limit:
2-Fluorophenol	48	32	162
Phenol-d6	34	10	170
Nitrobenzene-d5	100	50	150
2-Fluorobiphenyl	94	43	158
2,4,6-Tribromophenol	86	43	146
Terphenyl-d14	100	39	168

	Concentration		Concentration
Compounds:	ug/L (ppb)	Compounds:	ug/L (ppb)
Phenol	<5	2,4,6-Trichlorophenol	<1 j
Bis(2-chloroethyl) ether	<5	2,4,5-Trichlorophenol	<1 j
2-Chlorophenol	<1 j	2-Chloronaphthalene	< 0.5
1,3-Dichlorobenzene	< 0.5	2-Nitroaniline	< 0.5
1,4-Dichlorobenzene	< 0.5	Dimethyl phthalate	< 0.5
1,2-Dichlorobenzene	< 0.5	2,6-Dinitrotoluene	<0.1 j
Benzyl alcohol	<5	3-Nitroaniline	<1.5
Bis(2-chloroisopropyl) ether	<0.2 j	2,4-Dinitrophenol	<1 j
2-Methylphenol	<1 j	Dibenzofuran	< 0.5
Hexachloroethane	< 0.5	2,4-Dinitrotoluene	< 0.5
N-Nitroso-di-n-propylamine	<5	4-Nitrophenol	<1 j
3-Methylphenol + 4-Methylphe	nol <1 j	Diethyl phthalate	< 0.5
Nitrobenzene	< 0.5	4-Chlorophenyl phenyl ether	<0.2 j
Isophorone	< 0.5	N-Nitrosodiphenylamine	< 0.5
2-Nitrophenol	<1 j	4-Nitroaniline	<5
2,4-Dimethylphenol	<5	4,6-Dinitro-2-methylphenol	<1 j
Benzoic acid	<15 j	4-Bromophenyl phenyl ether	< 0.5
Bis(2-chloroethoxy)methane	< 0.5	Hexachlorobenzene	<0.2 j
2,4-Dichlorophenol	<1 j	Pentachlorophenol	<1 j
1,2,4-Trichlorobenzene	< 0.5	Carbazole	< 0.5
Hexachlorobutadiene	< 0.5	Di-n-butyl phthalate	< 0.5
4-Chloroaniline	<1.5	Benzyl butyl phthalate	< 0.5
4-Chloro-3-methylphenol	<1 j	Bis(2-ethylhexyl) phthalate	<5
2-Methylnaphthalene	< 0.5	Di-n-octyl phthalate	< 0.5
Hexachlorocyclopentadiene	<1.5	3,3'-Dichlorobenzidine	<2 j
N-Nitrosodimethylamine	<5 jl	2,3,4,6-Tetrachlorophenol	<50 L

#### ENVIRONMENTAL CHEMISTS

Date of Report: 03/20/12 Date Received: 03/06/12

Project: Christensen SW 11-0079(4), F&BI 203061

Date Extracted: 03/12/12 Date Analyzed: 03/13/12

# RESULTS FROM THE ANALYSIS OF WATER SAMPLES FOR PCBs AS AROCLORS USING EPA METHOD 8082A

Results Reported as ug/L (ppb)

Sample ID Laboratory ID	Aroclo <u>1221</u>	or <u>1232</u>	<u>1016</u>	<u>1242</u>	<u>1248</u>	<u>1254</u>	<u>1260</u>	Surrogate (% Rec.) (Limit 42-147)
SW-OWS-EF-030512 203061-01 1/0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	102
Method Blank 02-357 MB	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	129

#### ENVIRONMENTAL CHEMISTS

Date of Report: 03/20/12 Date Received: 03/06/12

Project: Christensen SW 11-0079(4), F&BI 203061

# QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR TPH AS GASOLINE USING METHOD NWTPH-Gx

Laboratory Code: 203061-01 (Duplicate)

				Relative Percent
	Reporting	Sample	Duplicate	Difference
Analyte	Units	Result	Result	(Limit 20)
Gasoline	ug/L (ppb)	<100	<100	nm

			Percent	
	Reporting	Spike	Recovery	Acceptance
Analyte	Units	Level	LCS	Criteria
Gasoline	ug/L (ppb)	1,000	102	69-134

#### ENVIRONMENTAL CHEMISTS

Date of Report: 03/20/12 Date Received: 03/06/12

Project: Christensen SW 11-0079(4), F&BI 203061

# QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR TOTAL PETROLEUM HYDROCARBONS AS DIESEL EXTENDED USING METHOD NWTPH-Dx

Laboratory Code: Laboratory Control Sample Silica Gel

			Percent	Percent			
	Reporting	Spike	Recovery	Recovery	Acceptance	RPD	
Analyte	Units	Level	LCS	LCSD	Criteria	(Limit 20)	
Diesel Extended	ug/L (ppb)	2,500	82	72	63-142	13	_

#### ENVIRONMENTAL CHEMISTS

Date of Report: 03/20/12 Date Received: 03/06/12

Project: Christensen SW 11-0079(4), F&BI 203061

#### QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR TOTAL METALS USING EPA METHOD 200.8

Laboratory Code: 203060-01 (Matrix Spike)

				Percent	Percent		
	Reporting	Spike	Sample	Recovery	Recovery	Acceptance	RPD
Analyte	Units	Level	Result	MS	MSD	Criteria	(Limit 20)
Chromium	ug/L (ppb)	20	<1	102	102	67-132	0
Nickel	ug/L (ppb)	20	1.12	102	102	73-119	0
Copper	ug/L (ppb)	20	3.09	101	100	50-144	1
Zinc	ug/L (ppb)	50	69.9	98 b	96 b	46-148	2 b
Arsenic	ug/L (ppb)	10	0.983	98	97	56-167	1
Selenium	ug/L (ppb)	5	<1	95	96	54-170	1
Silver	ug/L (ppb)	5	< 0.1	99	99	66-121	0
Cadmium	ug/L (ppb)	5	0.200	99	99	86-118	0
Barium	ug/L (ppb)	50	6.72	100	99	63-133	1
Lead	ug/L (ppb)	10	0.339	101	100	76-125	1
Manganese	ug/L (ppb)	20	8.89	109 b	107 b	50-150	2 b

			Percent	
	Reporting	Spike	Recovery	Acceptance
Analyte	Units	Level	LCS	Criteria
Chromium	ug/L (ppb)	20	96	66-135
Nickel	ug/L (ppb)	20	97	67-134
Copper	ug/L (ppb)	20	98	66-134
Zinc	ug/L (ppb)	50	95	57-135
Arsenic	ug/L (ppb)	10	96	55-128
Selenium	ug/L (ppb)	5	94	59-134
Silver	ug/L (ppb)	5	97	64-136
Cadmium	ug/L (ppb)	5	98	66-135
Barium	ug/L (ppb)	50	97	66-133
Lead	ug/L (ppb)	10	99	67-135
Manganese	ug/L (ppb)	20	103	70-130

#### ENVIRONMENTAL CHEMISTS

Date of Report: 03/20/12 Date Received: 03/06/12

Project: Christensen SW 11-0079(4), F&BI 203061

#### QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR TOTAL MERCURY USING EPA METHOD 1631E

Laboratory Code: 203060-01 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result	Percent Recover y MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Mercury	ug/L (ppb)	0.5	< 0.1	98	102	48-160	4

			Percent			
	Reporting	Spike	Recover	Acceptance		
Analyte	Units	Level	y	Criteria		
			LCS			
Mercury	ug/L (ppb)	0.5	98	79-126		

#### **ENVIRONMENTAL CHEMISTS**

Date of Report: 03/20/12 Date Received: 03/06/12

Project: Christensen SW 11-0079(4), F&BI 203061

# QUALITY ASSURANCE RESULTS FROM THE ANALYSIS OF WATER SAMPLES FOR TOTAL SUSPENDED SOLIDS BY METHOD 2540D

-	_		Percent	Percent		
	Reporting	Spike	Recovery	Recovery	Acceptance	RPD
Analyte	Units	Level	LCS	LCSD	Criteria	(Limit 20)
TSS	mg/L	50	90	88	61-131	2

#### **ENVIRONMENTAL CHEMISTS**

Date of Report: 03/20/12 Date Received: 03/06/12

Project: Christensen SW 11-0079(4), F&BI 203061

#### QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR PNA'S BY EPA METHOD 8270D SIM

·	-	_	Percent	Percent		
	Reporting	Spike	Recovery	Recovery	Acceptance	RPD
Analyte	Units	Level	LCS	LCSD	Criteria	(Limit 20)
Naphthalene	ug/L (ppb)	1	96	100	64-100	4
Acenaphthylene	ug/L (ppb)	1	96	102	67-104	6
Acenaphthene	ug/L (ppb)	1	96	101	65-103	5
Fluorene	ug/L (ppb)	1	94	97	64-106	3
Phenanthrene	ug/L (ppb)	1	96	102	66-106	6
Anthracene	ug/L (ppb)	1	97	102	67-112	5
Fluoranthene	ug/L (ppb)	1	106	113	69-116	7
Pyrene	ug/L (ppb)	1	100	106	68-115	6
Benz(a)anthracene	ug/L (ppb)	1	91	96	59-100	5
Chrysene	ug/L (ppb)	1	99	104 vo	66-103	5
Benzo(b)fluoranthene	ug/L (ppb)	1	97	103	59-114	6
Benzo(k)fluoranthene	ug/L (ppb)	1	100	106	55-111	6
Benzo(a)pyrene	ug/L (ppb)	1	97	102	54-111	5
Indeno(1,2,3-cd)pyrene	ug/L (ppb)	1	97	99	35-124	2
Dibenz(a,h)anthracene	ug/L (ppb)	1	92	96	35-116	4
Benzo(g,h,i)perylene	ug/L (ppb)	1	97	102	39-114	5

#### **ENVIRONMENTAL CHEMISTS**

Date of Report: 03/20/12 Date Received: 03/06/12

Project: Christensen SW 11-0079(4), F&BI 203061

#### QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR SEMIVOLATILES BY EPA METHOD 8270D

Edbordtory Code. Edbordtory	Control Samp	10	Percent	Percent		
Analyte	Reporting Units	Spike Level	Recovery LCS	Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
N-Nitrosodimethylamine	ug/L (ppb)	50	59	55	70-130	7
Phenol	ug/L (ppb)	50	35	29	18-52	19
Bis(2-chloroethyl) ether	ug/L (ppb)	50	88	85	52-113	3
2-Chlorophenol	ug/L (ppb)	50	83	73	50-110	13
1,3-Dichlorobenzene	ug/L (ppb)	50	85	82	45-109	4
1,4-Dichlorobenzene	ug/L (ppb)	50	84	83	44-118	1
1,2-Dichlorobenzene	ug/L (ppb)	50	85	82	46-116	4
Benzyl alcohol	ug/L (ppb)	50	82	74	42-100	10
Bis(2-chloroisopropyl) ether	ug/L (ppb)	50	92	92	51-124	0
2-Methylphenol	ug/L (ppb)	50	72	61	38-100	17
Hexachloroethane	ug/L (ppb)	50	87	84	42-117	4
N-Nitroso-di-n-propylamine	ug/L (ppb)	50	91	85	48-124	7
3-Methylphenol + 4-Methylphenol	ug/L (ppb)	50	67	55	48-87	20
Nitrobenzene	ug/L (ppb)	50	86	85	50-118	1
Isophorone	ug/L (ppb)	50	84	86	55-116	2
2-Nitrophenol	ug/L (ppb)	50	85	83	42-127	2
2,4-Dimethylphenol	ug/L (ppb)	50	71	63	45-100	12
Benzoic acid	ug/L (ppb)	75	32	25	10-46	25 vo
Bis(2-chloroethoxy)methane	ug/L (ppb)	50	84	85	55-115	1
2,4-Dichlorophenol	ug/L (ppb)	50	87	80	55-113	8
1.2.4-Trichlorobenzene	ug/L (ppb)	50	82	82	50-109	0
Hexachlorobutadiene	ug/L (ppb)	50	80	81	50-109	1
4-Chloroaniline	ug/L (ppb)	100	83	82	34-85	1
4-Chloro-3-methylphenol	ug/L (ppb)	50	86	79	54-114	8
2-Methylnaphthalene	ug/L (ppb)	50	83	82	53-113	1
Hexachlorocyclopentadiene	ug/L (ppb)	50	58	54	26-94	7
2,4,6-Trichlorophenol	ug/L (ppb)	50	87	81	46-114	7
2,4,5-Trichlorophenol	ug/L (ppb)	50	87	82	57-122	6
2-Chloronaphthalene	ug/L (ppb)	50	82	80	52-112	2
2-Nitroaniline	ug/L (ppb)	50	91	87	47-128	4
Dimethyl phthalate	ug/L (ppb)	50	84	84	55-116	0
2,6-Dinitrotoluene	ug/L (ppb)	50	84	84	49-126	0
3-Nitroaniline	ug/L (ppb)	100	69	71	32-89	3
2,4-Dinitrophenol	ug/L (ppb)	50	96	88	29-130	9
Dibenzofuran	ug/L (ppb)	50	82	81	53-113	1
2,4-Dinitrotoluene	ug/L (ppb)	50	89	87	48-129	2
4-Nitrophenol	ug/L (ppb)	50	51	39	12-59	27 vo
Diethyl phthalate	ug/L (ppb)	50	77	78	55-116	1
4-Chlorophenyl phenyl ether	ug/L (ppb)	50	82	82	52-115	0
N-Nitrosodiphenylamine	ug/L (ppb)	50	83	82	51-112	1
4-Nitroaniline	ug/L (ppb)	100	79	84	42-115	6
4,6-Dinitro-2-methylphenol	ug/L (ppb)	50	81	85	40-128	5
4-Bromophenyl phenyl ether	ug/L (ppb)	50	82	82	53-114	0
Hexachlorobenzene	ug/L (ppb)	50	84	82	54-115	2
Pentachlorophenol	ug/L (ppb)	50	93	86	49-114	8
Carbazole	ug/L (ppb)	50	84	81	54-115	4
Di-n-butyl phthalate	ug/L (ppb)	50	83	83	54-115	0
Benzyl butyl phthalate	ug/L (ppb)	50	85	84	53-122	1
Bis(2-ethylhexyl) phthalate	ug/L (ppb)	50	86	83	54-122	4
Di-n-octyl phthalate	ug/L (ppb)	50	83	92	50-131	10
Di-n-octyl phthalate Di-n-octyl phthalate	ug/L (ppb)	50	83	92	50-131	10
3.3'-Dichlorobenzidine	ug/L (ppb)	75	76	71	62-84	7
o,o Diemorobenziume	ag/L (PPD)	, ,	, 0	, .	02 01	•

#### **ENVIRONMENTAL CHEMISTS**

Date of Report: 03/20/12 Date Received: 03/06/12

Project: Christensen SW 11-0079(4), F&BI 203061

# QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR POLYCHLORINATED BIPHENYLS AS AROCLOR 1016/1260 BY EPA METHOD 8082A

	Reporting	Spike	% Recovery	% Recovery	Acceptance	RPD
Analyte	Units	Level	LCS	LCSD	Criteria	(Limit 20)
Aroclor 1016	ug/L (ppb)	1.25	90	95	48-139	5
Aroclor 1260	ug/L (ppb)	1.25	94	99	50-142	5

#### **ENVIRONMENTAL CHEMISTS**

#### **Data Qualifiers & Definitions**

- a The analyte was detected at a level less than five times the reporting limit. The RPD results may not provide reliable information on the variability of the analysis.
- A1 More than one compound of similar molecule structure was identified with equal probability.
- b The analyte was spiked at a level that was less than five times that present in the sample. Matrix spike recoveries may not be meaningful.
- ca The calibration results for this range fell outside of acceptance criteria. The value reported is an estimate.
- c The presence of the analyte indicated may be due to carryover from previous sample injections.
- d The sample was diluted. Detection limits may be raised due to dilution.
- ds The sample was diluted. Detection limits are raised due to dilution and surrogate recoveries may not be meaningful.
- dv Insufficient sample was available to achieve normal reporting limits and limits are raised accordingly.
- fb Analyte present in the blank and the sample.
- fc The compound is a common laboratory and field contaminant.
- hr The sample and duplicate were reextracted and reanalyzed. RPD results were still outside of control limits. The variability is attributed to sample inhomogeneity.
- ht Analysis performed outside the method or client-specified holding time requirement.
- ip Recovery fell outside of normal control limits. Compounds in the sample matrix interfered with the quantitation of the analyte.
- j The result is below normal reporting limits. The value reported is an estimate.
- J The internal standard associated with the analyte is out of control limits. The reported concentration is an estimate.
- jl The analyte result in the laboratory control sample is out of control limits. The reported concentration should be considered an estimate.
- jr The rpd result in laboratory control sample associated with the analyte is out of control limits. The reported concentration should be considered an estimate.
- js The surrogate associated with the analyte is out of control limits. The reported concentration should be considered an estimate.
- lc The presence of the compound indicated is likely due to laboratory contamination.
- L The reported concentration was generated from a library search.
- nm The analyte was not detected in one or more of the duplicate analyses. Therefore, calculation of the RPD is not applicable.
- pc The sample was received in a container not approved by the method. The value reported should be considered an estimate.
- pr The sample was received with incorrect preservation. The value reported should be considered an estimate.
- ve Estimated concentration calculated for an analyte response above the valid instrument calibration range. A dilution is required to obtain an accurate quantification of the analyte.
- vo The value reported fell outside the control limits established for this analyte.
- x The sample chromatographic pattern does not resemble the fuel standard used for quantitation.



Am Test Inc. 13600 NE 126TH PL Suite C Kirkland, WA 98034 (425) 885-1664 Professional Analytical Services

Mar 13 2012 Friedman & Bruya, Inc. 3012 16th Avenue West Seattle, WA 98119-2029 Attention: Michael Erdahl

Dear Michael Erdahl:

Enclosed please find the analytical data for your project.

The following is a cross correlation of client and laboratory identifications for your convenience.

CLIENT ID	MATRIX	AMTEST ID	TEST
SW-OWS-EF-030512	Water	12-A003092	DEM

Your sample was received on Tuesday, March 6, 2012. At the time of receipt, the sample was logged in and properly maintained prior to the subsequent analysis.

The analytical procedures used at AmTest are well documented and are typically derived from the protocols of the EPA, USDA, FDA or the Army Corps of Engineers.

Following the analytical data you will find the Quality Control (QC) results.

Please note that the detection limits that are listed in the body of the report refer to the Method Detection Limits (MDL's), as opposed to Practical Quantitation Limits (PQL's).

If you should have any questions pertaining to the data package, please feel free to conact me.

Sincerely,

Aaron W. Young Laboratory Manager

Project #: 203061 PO Number: B-592

BACT = Bacteriological CONV = Conventionals

MET = Metals ORG = Organics NUT=Nutrients DEM=Demand MIN=Minerals



Professional Analytical Services

#### **ANALYSIS REPORT**

Friedman & Bruya, Inc. 3012 16th Avenue West Seattle, WA 98119-2029 Attention: Michael Erdahl

Project #: 203061 PO Number: B-592

All results reported on an as received basis.

Date Received: 03/06/12 Date Reported: 3/13/12

**AMTEST Identification Number** 

Client Identification Sampling Date 12-A003092

SW-OWS-EF-030512 03/05/12, 09:50

#### **Demand**

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANALYST	DATE
Total Organic Carbon	5.1	mg/l		0.50	SM 5310B	ED	03/09/12

Aaron W. Young Laboratory Manager Am Test Inc. 13600 NE 126th PL Suite C Kirkland, WA, 98034 (425) 885-1664 www.amtestlab.com



QC Summary for sample number: 12-A003092

#### **DUPLICATES**

SAMPLE #	ANALYTE	UNITS	SAMPLE VALUE	<b>DUP VALUE</b>	RPD
12-A003138	Total Organic Carbon	mg/l	440	440	0.00
12-A003194	Total Organic Carbon	mg/l	2.2	2.1	4.7
12-A003218	Total Organic Carbon	mg/l	450	460	2.2

#### **MATRIX SPIKES**

SAMPLE #	ANALYTE	UNITS	SAMPLE VALUE	SMPL+ SPK	SPK AMT	RECOVERY
12-A003138	Total Organic Carbon	mg/l	440	490	50.	100.00 %
12-A003194	Total Organic Carbon	mg/l	2.2	51.	50.	97.60 %
12-A003218	Total Organic Carbon	mg/l	450	510	50.	120.00 %

#### STANDARD REFERENCE MATERIALS

ANALYTE	UNITS	TRUE VALUE	MEASURED VALUE	RECOVERY
Total Organic Carbon	mg/l	50.	48.	96.0 %
Total Organic Carbon	mg/l	50.	51.	102. %
Total Organic Carbon	mg/l	3.2	3.0	93.8 %

#### **BLANKS**

ANALYTE	UNITS	RESULT	
Total Organic Carbon	mg/l	< 0.5	
Total Organic Carbon	mg/l	< 0.5	
Total Organic Carbon	mg/l	< 0.5	

### SUBCONTRACT SAMPLE CHAIN OF CUSTODY

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Seattle, WA 98119-2029

Ph. (206) 285-8282

Fax (206) 283-5044

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by	Michael Erdahl	Friedman & Bruya	3/6/12	1100 AM
Received by:	O J. Olsen	Antel	3/6/12	12:20
Relinquished by:			, ,	. %
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11. 3

#### **ENVIRONMENTAL CHEMISTS**

James E. Bruya, Ph.D. Yelena Aravkina, M.S. Bradley T. Benson, B.S. Kurt Johnson, B.S. 3012 16th Avenue West Seattle, WA 98119-2029 TEL: (206) 285-8282 e-mail: fbi@isomedia.com

June 8, 2012

Chris Wohlers, Project Manager Wohlers Environmental Services, Inc. 7440 S.W. Hunziker St., Suite C Tigard, OR 97223

Dear Mr. Wohlers:

Included are the results from the testing of material submitted on May 22, 2012 from the 11-0079(4), F&BI 205314 project. There are 21 pages included in this report. Any samples that may remain are currently scheduled for disposal in 30 days. If you would like us to return your samples or arrange for long term storage at our offices, please contact us as soon as possible.

We appreciate this opportunity to be of service to you and hope you will call if you should have any questions.

Sincerely,

FRIEDMAN & BRUYA, INC.

Michael Erdahl Project Manager

**Enclosures** 

c: Kelly Branson, Evelyn Cummings WOH0608R.DOC

# FRIEDMAN & BRUYA, INC. ENVIRONMENTAL CHEMISTS

#### **CASE NARRATIVE**

This case narrative encompasses samples received on May 22, 2012 by Friedman & Bruya, Inc. from the Wohlers Environmental Services 11-0079(4), F&BI 205314 project. Samples were logged in under the laboratory ID's listed below.

<u>Laboratory ID</u> <u>Wohlers Environmental Services</u>

205314-01 SW-OWS-EF-052112

Sample SW-OWS-EF-052112 was sent to Amtest for TOC analysis. Review of the enclosed report indicates that all quality assurance were acceptable.

All quality control requirements were acceptable.

#### ENVIRONMENTAL CHEMISTS

Date of Report: 06/08/12 Date Received: 05/22/12

Project: 11-0079(4), F&BI 205314

Date Extracted: 05/22/12

Date Analyzed: 05/22/12 and 05/23/12

# RESULTS FROM THE ANALYSIS OF WATER SAMPLES FOR TOTAL PETROLEUM HYDROCARBONS AS GASOLINE USING METHOD NWTPH-Gx

Results Reported as ug/L (ppb)

Sample ID Laboratory ID	Gasoline Range	Surrogate (% Recovery) (Limit 51-134)
SW-OWS-EF-052112 205314-01	<100	97
Method Blank 02-0889 MB	<100	97

#### **ENVIRONMENTAL CHEMISTS**

Date of Report: 06/08/12 Date Received: 05/22/12

Project: 11-0079(4), F&BI 205314

Date Extracted: 05/22/12 Date Analyzed: 05/25/12

# RESULTS FROM THE ANALYSIS OF WATER SAMPLES FOR TOTAL PETROLEUM HYDROCARBONS AS DIESEL AND MOTOR OIL USING METHOD NWTPH-Dx Sample Extracts Passed Through a Silica Gel Column Prior to Analysis

Results Reported as ug/L (ppb)

Sample ID Laboratory ID	Diesel Range (C <sub>10</sub> -C <sub>25</sub> )	Motor Oil Range (C <sub>25</sub> -C <sub>36</sub> )	Surrogate (% Recovery) (Limit 51-134)
SW-OWS-EF-052112 205314-01	100 x	490	75
Method Blank 02-871 MB2	<50	<250	103

#### ENVIRONMENTAL CHEMISTS

#### Analysis For Total Metals By EPA Method 200.8

Client ID:	SW-OWS-EF-052112	Client:	Wohlers Environmental Services

Date Received: 05/22/12 Project: 11-0079(4), F&BI 205314 Lab ID: Date Extracted: 05/24/12 205314-01 Date Analyzed: 05/29/12 Data File: 205314-01.025 Matrix: Instrument: Water ICPMS1 ug/L (ppb) Units: Operator: AP

		Lower	Upper
Internal Standard:	% Recovery:	Limit:	Limit:
Germanium	91	60	125
Indium	87	60	125
Holmium	93	60	125

230

#### Concentration

Analyte:	ug/L (ppb)
Chromium	<1
Nickel	3.08
Copper	12.7
Zinc	291
Arsenic	0.763 j
Selenium	<1
Silver	<0.1 j
Cadmium	0.649 j
Barium	52.9
Lead	2.45

Manganese

#### ENVIRONMENTAL CHEMISTS

#### Analysis For Total Metals By EPA Method 200.8

Client ID: Method Blank	Client:	Wohlers Environmental Services
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Date Received: NA Project: 11-0079(4), F&BI 205314 Lab ID: Date Extracted: 05/24/12 I2-338 mb Date Analyzed: 05/29/12 Data File: I2-338 mb.011 Matrix: Water Instrument: ICPMS1 Units: ug/L (ppb) Operator: AP

Internal Standard:	% Recovery:	Lower Limit:	Upper Limit:
Germanium	112	60	125
Indium	98	60	125
Holmium	100	60	125

#### Concentration

	Concentration	
Analyte:	ug/L (ppb)	
Chromium	<1	
Nickel	<1	
Copper	<1	
Zinc	<1	
Arsenic	<0.5 j	
Selenium	<1	
Silver	<0.1 j	
Cadmium	<0.1 j	
Barium	<1	
Lead	<0.1 j	
Manganese	<1	

#### ENVIRONMENTAL CHEMISTS

Date of Report: 06/08/12 Date Received: 05/22/12

Project: 11-0079(4), F&BI 205314

Date Extracted: 05/22/12 Date Analyzed: 05/23/12

#### RESULTS FROM THE ANALYSIS OF THE WATER SAMPLES FOR TOTAL MERCURY USING EPA METHOD 1631E

Results Reported as ug/L (ppb)

Sample ID	<u>Total Mercury</u>
Laboratory ID	-
SW-OWS-EF-052112	< 0.1
205314-01	
Method Blank	< 0.1

#### ENVIRONMENTAL CHEMISTS

### Analysis For Semivolatile Compounds By EPA Method 8270D

Client Sample ID:	SW-OWS-EF-052112	Client:	Wohlers Environmental Services
Date Received:	05/22/12	Project:	11-0079(4), F&BI 205314
Date Extracted:	05/23/12	Lab ID:	205314-01 1/2.5
Date Analyzed:	06/01/12	Data File:	060104.D
Matrix:	Water	Instrument:	GCMS8
Units:	ug/L (ppb)	Operator:	ya

		Lower	Upper
Surrogates:	% Recovery:	Limit:	Limit:
2-Fluorophenol	59	32	162
Phenol-d6	49	10	170
Nitrobenzene d5	87	50	150
2-Fluorobiphenyl	83	43	158
2,4,6-Tribromophenol	93	43	146
Terphenyl-d14	80	39	168

	Concentration		Concentration
Compounds:	ug/L (ppb)	Compounds:	ug/L (ppb)
Phenol	<5	2,4,6-Trichlorophenol	<1 j
Bis(2-chloroethyl) ether	<5	2,4,5-Trichlorophenol	<1 j
2-Chlorophenol	<1 j	2-Chloronaphthalene	< 0.5
1,3-Dichlorobenzene	< 0.5	2-Nitroaniline	<1.5
1,4-Dichlorobenzene	< 0.5	Dimethyl phthalate	0.76
1,2-Dichlorobenzene	< 0.5	2,6-Dinitrotoluene	<0.1 j
Benzyl alcohol	<5	3-Nitroaniline	<1.5
Bis(2-chloroisopropyl) ether	<0.2 j	2,4-Dinitrophenol	<15
2-Methylphenol	<1 j	Dibenzofuran	< 0.5
Hexachloroethane	< 0.5	2,4-Dinitrotoluene	< 0.5
N-Nitroso-di-n-propylamine	<5	4-Nitrophenol	<5
3-Methylphenol + 4-Methylphenol	ol <1 j	Diethyl phthalate	< 0.5
Nitrobenzene	< 0.5	4-Chlorophenyl phenyl ether	<0.2 j
Isophorone	< 0.5	N-Nitrosodiphenylamine	< 0.5
2-Nitrophenol	<1 j	4-Nitroaniline	<5
2,4-Dimethylphenol	<5	4,6-Dinitro-2-methylphenol	<1 j
Benzoic acid	<15 j	4-Bromophenyl phenyl ether	< 0.5
Bis(2-chloroethoxy)methane	< 0.5	Hexachlorobenzene	<0.2 j
2,4-Dichlorophenol	<1 j	Pentachlorophenol	<1 j
1,2,4-Trichlorobenzene	< 0.5	Carbazole	< 0.5
Hexachlorobutadiene	< 0.5	Di-n-butyl phthalate	< 0.5
4-Chloroaniline	<1.5	Benzyl butyl phthalate	< 0.5
4-Chloro-3-methylphenol	<1 j	Bis(2-ethylhexyl) phthalate	<5
2-Methylnaphthalene	< 0.5	Di-n-octyl phthalate	< 0.5
Hexachlorocyclopentadiene	<1.5	3,3-Dichlorobenzidine	<2 j
N-Nitrosodimethylamine	<5 L	2,3,4,6-Tetrachlorophenol	<50 L

#### ENVIRONMENTAL CHEMISTS

### Analysis For Semivolatile Compounds By EPA Method 8270D

Client Sample ID:	Method Blank	Client:	Wohlers Environmental Services
Date Received:	NA	Project:	11-0079(4), F&BI 205314
Date Extracted:	05/23/12	Lab ID:	02-0890 mb 1/2.5
Date Analyzed:	05/29/12	Data File:	052905.D
Matrix:	Water	Instrument:	GCMS8
Units:	ug/L (ppb)	Operator:	ya

		Lower	Upper
Surrogates:	% Recovery:	Limit:	Limit:
2-Fluorophenol	44	32	162
Phenol-d6	28	10	170
Nitrobenzene-d5	82	50	150
2-Fluorobiphenyl	84	43	158
2,4,6-Tribromophenol	82	43	146
Terphenyl-d14	87	39	168

	Concentration		Concentration
Compounds:	ug/L (ppb)	Compounds:	ug/L (ppb)
Phen ol	<5	2,4,6-Trichlorophenol	<1 j
Bis(2-chloroethyl) ether	<5	2,4,5-Trichlorophenol	<1 j
2-Chlorophenol	<1 j	2-Chloronaphthalene	< 0.5
1,3-Dichlorobenzene	< 0.5	2-Nitroaniline	<1.5
1,4-Dichlorobenzene	< 0.5	Dimethyl phthalate	< 0.5
1,2-Dichlorobenzene	< 0.5	2,6-Dinitrotoluene	<0.1 j
Benzyl alcohol	<5	3-Nitroaniline	<1.5
Bis(2-chloroisopropyl) ether	<0.2 j	2,4-Dinitrophenol	<1 j
2-Methylphenol	<1 j	Dibenzofuran	< 0.5
Hexachloroethane	< 0.5	2,4-Dinitrotoluene	< 0.5
N-Nitroso-di-n-propylamine	<5	4-Nitrophenol	<1 j
3-Methylphenol + 4-Methylphenol	ol <1 j	Diethyl phthalate	< 0.5
Nitrobenzene	< 0.5	4-Chlorophenyl phenyl ether	<0.2 j
Isophorone	< 0.5	N-Nitrosodiphenylamine	< 0.5
2-Nitrophenol	<1 j	4-Nitroaniline	<5
2,4-Dimethylphenol	<5	4,6-Dinitro-2-methylphenol	<1 j
Benzoic acid	<15 j	4-Bromophenyl phenyl ether	< 0.5
Bis(2-chloroethoxy)methane	< 0.5	Hexachlorobenzene	<0.2 j
2,4-Dichlorophenol	<1 j	Pentachlorophenol	<1 j
1,2,4-Trichlorobenzene	< 0.5	Carbazole	< 0.5
Hexachlorobutadiene	< 0.5	Di-n-butyl phthalate	< 0.5
4-Chloroaniline	<1.5	Benzyl butyl phthalate	< 0.5
4-Chloro-3-methylphenol	<1 j	Bis(2-ethylhexyl) phthalate	<5
2-Methylnaphthalene	< 0.5	Di-n-octyl phthalate	< 0.5
Hexachlorocyclopentadiene	<1.5	3,3-Dichlorobenzidine	<2 j
N-Nitrosodimethylamine	<5 L	2,3,4,6-Tetrachlorophenol	<50 L

#### **ENVIRONMENTAL CHEMISTS**

#### Analysis For Semivolatile Compounds By EPA Method 8270D SIM

Client Sample ID:	SW-OWS-EF-052112	Client:	Wohlers Environmental Services

Date Received: 05/22/12 Project: 11-0079(4), F&BI 205314 Date Extracted: 05/23/12 Lab ID: 205314-01 Date Analyzed: 05/26/12 Data File: 052532.D Matrix: Water Instrument: GCMS6 Units: YA ug/L (ppb) Operator:

		Lower	Upper
Surrogates:	% Recovery:	Limit:	Limit:
Anthracene-d10	76	50	150
Benzo(a)anthracene-d12	117	50	129

#### Concentration Compounds: ug/L (ppb) Naphthalene < 0.05 Acenaphthylene < 0.05 Acenaphthene < 0.05 Fluorene < 0.05 Phenanthrene < 0.05 Anthracene < 0.05 Fluoranthene < 0.05 **Pyrene** < 0.05 Benz(a)anthracene < 0.018 Chrysene < 0.018 Benzo(a)pyrene < 0.018 Benzo(b)fluoranthene < 0.018 Benzo(k)fluoranthene < 0.018 Indeno(1,2,3-cd)pyrene < 0.018 Dibenz(a,h)anthracene < 0.018 Benzo(g,h,i)perylene < 0.05

#### **ENVIRONMENTAL CHEMISTS**

#### Analysis For Semivolatile Compounds By EPA Method 8270D SIM

Client Sample ID:	Method Blank	Client:	Wohlers Environmental Services
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Date Received: NA Project: 11-0079(4), F&BI 205314
Date Extracted: 05/23/12 Lab ID: 02-0891 mb

Date Extracted: 05/23/12 Lab ID: 02-0891 mb
Date Analyzed: 05/25/12 Data File: 052512.D
Matrix: Water Instrument: GCMS6
Units: ug/L (ppb) Operator: YA

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	94	50	150
Benzo(a)anthracene-d12	98	50	129

#### Concentration Compounds: ug/L (ppb) Naphthalene < 0.05 Acenaphthylene < 0.05 Acenaphthene < 0.05 Fluorene < 0.05 Phenanthrene < 0.05 Anthracene < 0.05 Fluoranthene < 0.05

#### ENVIRONMENTAL CHEMISTS

Date of Report: 06/08/12 Date Received: 05/22/12

Project: 11-0079(4), F&BI 205314

Date Extracted: 05/22/12 Date Analyzed: 05/22/12

#### RESULTS FROM THE ANALYSIS OF WATER SAMPLES FOR TOTAL SUSPENDED SOLIDS BY METHOD 2540D

Results Reported as mg/L (ppm)

Sample ID Laboratory ID	Total Suspended <u>Solids</u>
SW-OWS-EF-052112 dv 205314-01	<25
Method Blank	<10

#### ENVIRONMENTAL CHEMISTS

Date of Report: 06/08/12 Date Received: 05/22/12

Project: 11-0079(4), F&BI 205314

Date Extracted: 05/23/12 Date Analyzed: 05/31/12

#### RESULTS FROM THE ANALYSIS OF WATER SAMPLES FOR PCBs AS AROCLORS USING EPA METHOD 8082A

Results Reported as ug/L (ppb)

Sample ID Laboratory ID	Aroclo <u>1221</u>	or <u>1232</u>	<u>1016</u>	<u>1242</u>	1248	<u>1254</u>	<u>1260</u>	Surrogate (% Rec.) (Limit 42-147)
SW-OWS-EF-052112 205314-01 1/0.25	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	141
Method Blank 02-899 MB 1/0.25	<0.025	< 0.025	<0.025	< 0.025	< 0.025	<0.025	<0.025	77

#### **ENVIRONMENTAL CHEMISTS**

Date of Report: 06/08/12 Date Received: 05/22/12

Project: 11-0079(4), F&BI 205314

# QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR TPH AS GASOLINE USING METHOD NWTPH-Gx

Laboratory Code: 205314-01 (Duplicate)

				Relative Percent
	Reporting	Sample	Duplicate	Difference
Analyte	Units	Result	Result	(Limit 20)
Gasoline	ug/L (ppb)	<100	<100	nm

		Percent				
	Reporting	Spike	Recovery	Acceptance		
Analyte	Units	Level	LCS	Criteria		
Gasoline	ug/L (ppb)	1,000	95	69-134	_	

#### ENVIRONMENTAL CHEMISTS

Date of Report: 06/08/12 Date Received: 05/22/12

Project: 11-0079(4), F&BI 205314

# QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR TOTAL PETROLEUM HYDROCARBONS AS DIESEL EXTENDED USING METHOD NWTPH-Dx

Laboratory Code: Laboratory Control Sample Silica Gel

			Percent	Percent		
	Reporting	Spike	Recovery	Recovery	Acceptance	RPD
Analyte	Units	Level	LCS	LCSD	Criteria	(Limit 20)
Diesel Extended	ug/L (ppb)	2,500	90	96	58-134	6

#### ENVIRONMENTAL CHEMISTS

Date of Report: 06/08/12 Date Received: 05/22/12

Project: 11-0079(4), F&BI 205314

#### QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR TOTAL METALS USING EPA METHOD 200.8

Laboratory Code: 205300-02 (Matrix Spike)

				Percent	Percent		
	Reporting	Spike	Sample	Recovery	Recovery	Acceptance	RPD
Analyte	Units	Level	Result	MS	MSD	Criteria	(Limit 20)
Chromium	ug/L (ppb)	20	<1	96	95	71-130	1
Nickel	ug/L (ppb)	20	1.14	93	93	71-120	0
Copper	ug/L (ppb)	20	2.83	93	92	52-134	1
Zinc	ug/L (ppb)	50	1,730	95 b	129 b	51-142	30 b
Arsenic	ug/L (ppb)	10	< 0.5	96	99	51-167	3
Selenium	ug/L (ppb)	5	<1	97	97	41-185	0
Silver	ug/L (ppb)	5	< 0.1	99	100	73-114	1
Cadmium	ug/L (ppb)	5	0.161	100	102	86-115	2
Barium	ug/L (ppb)	50	4.25	100	102	75-127	2
Lead	ug/L (ppb)	10	0.655	103	100	85-115	3
Manganese	ug/L (ppb)	20	1.95	95	95	54-157	0

			Percent	
	Reporting	Spike	Recovery	Acceptance
Analyte	Units	Level	LCS	Criteria
Chromium	ug/L (ppb)	20	84	80-119
Nickel	ug/L (ppb)	20	85	83-119
Copper	ug/L (ppb)	20	84	81-120
Zinc	ug/L (ppb)	50	84	82-120
Arsenic	ug/L (ppb)	10	95	81-118
Selenium	ug/L (ppb)	5	93	77-124
Silver	ug/L (ppb)	5	95	85-116
Cadmium	ug/L (ppb)	5	104	86-118
Barium	ug/L (ppb)	50	96	85-116
Lead	ug/L (ppb)	10	96	84-120
Manganese	ug/L (ppb)	20	83	81-122

#### ENVIRONMENTAL CHEMISTS

Date of Report: 06/08/12 Date Received: 05/22/12

Project: 11-0079(4), F&BI 205314

#### QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR TOTAL MERCURY USING EPA METHOD 1631E

Laboratory Code: 205313-01 (Matrix Spike)

				Percent	Percent		
	Reporting	Spike	Sample	Recovery	Recovery	Acceptance	RPD
Analyte	Units	Level	Result	MS	MSD	Criteria	(Limit 20)
Mercury	ug/L (nnh)	0.5	< 0.1	105	105	78-124	0

			Percent	
	Reporting	Spike	Recovery	Acceptance
Analyte	Units	Level	LCS	Criteria
Mercury	ug/L (ppb)	0.5	97	78-123

#### ENVIRONMENTAL CHEMISTS

Date of Report: 06/08/12 Date Received: 05/22/12

Project: 11-0079(4), F&BI 205314

## QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR SEMIVOLATILES BY EPA METHOD 8270D

3	•		Percent	Percent		
	Reporting	Spike	Recovery	Recovery	Acceptance	RPD
Analyte	Units	Level	LCS	LCSD	Criteria	(Limit 20)
Phenol	ug/L (ppb)	50	33	35	18-52	6
Bis(2-chloroethyl) ether	ug/L (ppb)	50	69	79	52-113	14
2-Chlorophenol	ug/L (ppb)	50	69	76	50-110	10
1,3-Dichlorobenzene	ug/L (ppb)	50	74	82	45-109	10
1,4-Dichlorobenzene	ug/L (ppb)	50	74	83	44-118	11
1,2-Dichlorobenzene	ug/L (ppb)	50	73	82	46-116	12
Benzyl alcohol	ug/L (ppb)	50	61	65	42-100	6
Bis(2-chloroisopropyl) ether	ug/L (ppb)	50	68	75	51-124	10
2-Methylphenol	ug/L (ppb)	50	58	66	38-100	13
Hexachloroethane	ug/L (ppb)	50	74	82	42-117	10
N-Nitroso-di-n-propylamine	ug/L (ppb)	50	71	77	48-124	8
3-Methylphenol + 4-Methylphenol	ug/L (ppb)	50	54	58	48-87	7
Nitrobenzene	ug/L (ppb)	50	79	87	50-118	10
Isophorone	ug/L (ppb)	50	81	90	55-116	11
2-Nitrophenol	ug/L (ppb)	50	83	90	42-127	8
2,4-Dimethylphenol	ug/L (ppb)	50	46 28	60	45-100	26 vo
Benzoic acid	ug/L (ppb) ug/L (ppb)	75 50	28 78	25 87	10-46 55-115	11 11
Bis(2-chloroethoxy)methane		50 50	76 80	85	55-113	6
2,4-Dichlorophenol	ug/L (ppb) ug/L (ppb)	50 50	78	85	50-109	9
1,2,4-Trichlorobenzene	ug/L (ppb) ug/L (ppb)	50 50	78 79	85 87	50-109 50-109	10
Hexachlorobutadiene	ug/L (ppb)	100	73	79	34-85	9
4-Chloroaniline	ug/L (ppb) ug/L (ppb)	50	72 76	83	54-114	9
4-Chloro-3-methylphenol	ug/L (ppb) ug/L (ppb)	50 50	76 77	84	53-113	9
2-Methylnaphthalene	ug/L (ppb)	50	36	43	26-94	18
Hexachlorocyclopentadiene	ug/L (ppb)	50 50	81	90	46-114	11
2,4,6-Trichlorophenol	ug/L (ppb)	50	83	92	57-122	10
2,4,5-Trichlorophenol	ug/L (ppb)	50	81	89	52-112	9
2-Chloronaphthalene 2-Nitroaniline	ug/L (ppb)	50	86	94	47-128	9
Dimethyl phthalate	ug/L (ppb)	50	82	91	55-116	10
2.6-Dinitrotoluene	ug/L (ppb)	50	87	97	49-126	11
2,6-Dinitrotoluene 3-Nitroaniline	ug/L (ppb)	100	74	83	32-89	11
2,4-Dinitrophenol	ug/L (ppb)	50	65	67	29-130	3
Dibenzofuran	ug/L (ppb)	50	81	90	53-113	11
2.4-Dinitrotoluene	ug/L (ppb)	50	81	90	48-129	11
4-Nitrophenol	ug/L (ppb)	50	43	45	12-59	5
Diethyl phthalate	ug/L (ppb)	50	83	93	55-116	11
4-Chlorophenyl phenyl ether	ug/L (ppb)	50	81	90	52-115	11
N-Nitrosodiphenylamine	ug/L (ppb)	50	81	89	51-112	9
4-Nitroaniline	ug/L (ppb)	100	71	75	42-115	5
4,6-Dinitro-2-methylphenol	ug/L (ppb)	50	74	75	40-128	1
4-Bromophenyl phenyl ether	ug/L (ppb)	50	82	91	53-114	10
Hexachlorobenzene	ug/L (ppb)	50	82	91	54-115	10
Pentachlorophenol	ug/L (ppb)	50	67	73	49-114	9
Carbazole	ug/L (ppb)	50	82	90	54-115	9
Di-n-butyl phthalate	ug/L (ppb)	50	87	96	54-115	10
Benzyl butyl phthalate	ug/L (ppb)	50	84	91	53-122	8
Bis(2-ethylhexyl) phthalate	ug/L (ppb)	50	85	91	54-122	7
Di-n-octyl phthalate	ug/L (ppb)	50	88	94	50-131	7
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#### ENVIRONMENTAL CHEMISTS

Date of Report: 06/08/12 Date Received: 05/22/12

Project: 11-0079(4), F&BI 205314

# QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR PNA'S BY EPA METHOD 8270D SIM

-	-	_	Percent	Percent		
	Reporting	Spike	Recovery	Recovery	Acceptance	RPD
Analyte	Units	Level	LCS	LCSD	Criteria	(Limit 20)
Naphthalene	ug/L (ppb)	1	88	95	61-109	8
Acenaphthylene	ug/L (ppb)	1	89	98	60-110	10
Acenaphthene	ug/L (ppb)	1	89	97	61-110	9
Fluorene	ug/L (ppb)	1	84	89	55-120	6
Phenanthrene	ug/L (ppb)	1	91	100	61-111	9
Anthracene	ug/L (ppb)	1	91	99	58-112	8
Fluoranthene	ug/L (ppb)	1	98	107	60-118	9
Pyrene	ug/L (ppb)	1	96	103	54-120	7
Benz(a)anthracene	ug/L (ppb)	1	90	96	55-109	6
Chrysene	ug/L (ppb)	1	94	102	61-118	8
Benzo(b)fluoranthene	ug/L (ppb)	1	95	105	54-121	10
Benzo(k)fluoranthene	ug/L (ppb)	1	86	103	61-119	18
Benzo(a)pyrene	ug/L (ppb)	1	93	102	57-118	9
Indeno(1,2,3-cd)pyrene	ug/L (ppb)	1	95	104	51-135	9
Dibenz(a,h)anthracene	ug/L (ppb)	1	87	100	59-116	14
Benzo(g,h,i)perylene	ug/L (ppb)	1	85	98	58-117	14

#### ENVIRONMENTAL CHEMISTS

Date of Report: 06/08/12 Date Received: 05/22/12

Project: 11-0079(4), F&BI 205314

# QUALITY ASSURANCE RESULTS FROM THE ANALYSIS OF WATER SAMPLES FOR TOTAL SUSPENDED SOLIDS BY METHOD 2540D

			Percent	Percent		
	Reporting	Spike	Recovery	Recovery	Acceptance	RPD
Analyte	Units	Level	LCS	LCSD	Criteria	(Limit 20)
TSS	mg/L	50	75	76	61-131	1

#### ENVIRONMENTAL CHEMISTS

Date of Report: 06/08/12 Date Received: 05/22/12

Project: 11-0079(4), F&BI 205314

# QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR POLYCHLORINATED BIPHENYLS AS AROCLOR 1016/1260 BY EPA METHOD 8082A

	Reporting	Spike	% Recovery	% Recovery	Acceptance	RPD
Analyte	Units	Level	LCS	LCSD	Criteria	(Limit 20)
Aroclor 1016	ug/L (ppb)	2.5	73	85	48-139	15
Aroclor 1260	ug/L (ppb)	2.5	87	94	50-142	8

#### **ENVIRONMENTAL CHEMISTS**

#### **Data Qualifiers & Definitions**

- a The analyte was detected at a level less than five times the reporting limit. The RPD results may not provide reliable information on the variability of the analysis.
- A1 More than one compound of similar molecule structure was identified with equal probability.
- b The analyte was spiked at a level that was less than five times that present in the sample. Matrix spike recoveries may not be meaningful.
- ${\it ca}$  The calibration results for this range fell outside of acceptance criteria. The value reported is an estimate.
- c The presence of the analyte indicated may be due to carryover from previous sample injections.
- d The sample was diluted. Detection limits may be raised due to dilution.
- ds The sample was diluted. Detection limits are raised due to dilution and surrogate recoveries may not be meaningful.
- dv Insufficient sample was available to achieve normal reporting limits and limits are raised accordingly.
- fb Analyte present in the blank and the sample.
- fc The compound is a common laboratory and field contaminant.
- hr The sample and duplicate were reextracted and reanalyzed. RPD results were still outside of control limits. The variability is attributed to sample inhomogeneity.
- ht Analysis performed outside the method or client-specified holding time requirement.
- $ip\ Recovery\ fell\ outside\ of\ normal\ control\ limits.\ Compounds\ in\ the\ sample\ matrix\ interfered\ with\ the\ quantitation\ of\ the\ analyte.$
- j The result is below normal reporting limits. The value reported is an estimate.
- $\boldsymbol{J}$  The internal standard associated with the analyte is out of control limits. The reported concentration is an estimate.
- jl The analyte result in the laboratory control sample is out of control limits. The reported concentration should be considered an estimate.
- jr The rpd result in laboratory control sample associated with the analyte is out of control limits. The reported concentration should be considered an estimate.
- js The surrogate associated with the analyte is out of control limits. The reported concentration should be considered an estimate.
- lc The presence of the compound indicated is likely due to laboratory contamination.
- L The reported concentration was generated from a library search.
- nm The analyte was not detected in one or more of the duplicate analyses. Therefore, calculation of the RPD is not applicable.
- pc The sample was received in a container not approved by the method. The value reported should be considered an estimate.
- $\operatorname{pr}$  The sample was received with incorrect preservation. The value reported should be considered an estimate.
- ve Estimated concentration calculated for an analyte response above the valid instrument calibration range. A dilution is required to obtain an accurate quantification of the analyte.
- vo The value reported fell outside the control limits established for this analyte.
- x The sample chromatographic pattern does not resemble the fuel standard used for quantitation.

#### ENVIRONMENTAL CHEMISTS



Am Test Inc. 13600 NE 126TH PL Suite C Kirkland, WA 98034 (425) 885-1664 Professional Analytical Services

Jun 4 2012 Friedman & Bruya, Inc. 3012 16th Avenue West Seattle, WA 98119-2029 Attention: Michael Erdahl

Dear Michael Erdahl:

Enclosed please find the analytical data for your project.

The following is a cross correlation of client and laboratory identifications for your convenience.

CLIENT ID	MATRIX	AMTEST ID	TEST
SW-OWS-EF	Water	12-A007726	DEM

Your sample was received on Wednesday, May 23, 2012. At the time of receipt, the sample was logged in and properly maintained prior to the subsequent analysis.

The analytical procedures used at AmTest are well documented and are typically derived from the protocols of the EPA, USDA, FDA or the Army Corps of Engineers.

Following the analytical data you will find the Quality Control (QC) results.

Please note that the detection limits that are listed in the body of the report refer to the Method Detection Limits (MDL's), as opposed to Practical Quantitation Limits (PQL's).

If you should have any questions pertaining to the data package, please feel free to conact me.

Sincerely,

Aaron W. Young Laboratory Manager

Project #: 205314 PO Number: B-737

BACT = Bacteriological CONV = Conventionals

MET = Metals ORG = Organics NUT=Nutrients DEM=Demand

MIN=Minerals

Am Test Inc. 13600 NE 126TH PL Suite C Kirkland, WA 98034 (425) 885-1664 www.amtestlab.com



Professional Analytical Services

#### **ANALYSIS REPORT**

Friedman & Bruya, Inc. 3012 16th Avenue West Seattle, WA 98119-2029 Attention: Michael Erdahl

Project #: 205314 PO Number: B-737

All results reported on an as received basis.

Date Received: 05/23/12 Date Reported: 6/4/12

\_\_\_\_\_

AMTEST Identification Number 12-A007726
Client Identification SW-OWS-EF
Sampling Date 05/21/12

#### **Demand**

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANALYST	DATE
Total Organic Carbon	27.	mg/l		0.5	SM 5310B	ED	06/01/12

Aaron W. Young Laboratory Manager

#### Am Test Inc. 13600 NE 126th PL Suite C Kirkland, WA, 98034 (425) 885-1664 www.amtestlab.com



QC Summary for sample number: 12-A007726

#### **DUPLICATES**

SAMPLE#	ANALYTE	UNITS	SAMPLE VALUE	DUP VALUE	RPD
12-A007725	Total Organic Carbon	mg/l	24.	24.	0.00
12-A007899	Total Organic Carbon	mg/l	1.2	1.2	0.00
12-A007950	Total Organic Carbon	mg/l	1.2	1.2	0.00
AM7952	Total Organic Carbon	mg/l	1.6	1.6	0.00

#### **MATRIX SPIKES**

SAMPLE#	ANALYTE	UNITS	SAMPLE VALUE	SMPL+ SPK	SPK AMT	RECOVERY
12-A007725	Total Organic Carbon	mg/l	24.	70.	50.	92.00 %
12-A007899	Total Organic Carbon	mg/l	1.2	48.	50.	93.60 %
12-A007950	Total Organic Carbon	mg/l	1.2	47.	50.	91.60 %
AM7952	Total Organic Carbon	mg/l	1.6	48.	50.	92.80 %

#### STANDARD REFERENCE MATERIALS

ANALYTE	UNITS	TRUE VALUE	MEASURED VALUE	RECOVERY
Total Organic Carbon	mg/l	50.	47.	94.0 %
Total Organic Carbon	mg/l	50.	47.	94.0 %
Total Organic Carbon	mg/l	50.	46.	92.0 %
Total Organic Carbon	mg/l	50.	46.	92.0 %

#### **BLANKS**

ANALYTE	UNITS	RESULT	
Total Organic Carbon	mg/l	< 0.5	
Total Organic Carbon	mg/l	< 0.5	
Total Organic Carbon	mg/l	< 0.5	
Total Organic Carbon	mg/l	< 0.5	

#### SUBCONTRACT SAMPLE CHAIN OF CUSTODY

					SUB	CONT	RACTE	CR ,	, .	4				1	P	age#_	l of	
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Friedman & Bruye	a, Inc.		SIGNATURE	***************************************	WAR CARE		F	RINT	NAM	E			СО	MPA	ANY		DATE	TIME

Seattle, WA 98119-2029 Ph. (206) 285-8282 Fax (206) 283-5044

3012 16th Avenue West

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinguished by	Michael Erdahl	Friedman & Bruya	5/22/12	12:00
Received by:	JOlsen	Antest	5/23/12	3:00
Relinquished by:			' /	
Received by:				

Page # \_\_\_\_



Total Metals: As, Ba, Cd, Cr, Cu, Ph, Mn, Hg, Ni, Se, Ag, Zn

### CHAIN OF CUSTODY RECORD

ME 05/22/12		VI/AI2/203
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ENVIRONMENTAL SERVICES, INC.				_	<b>.</b> .							Dai	ie: _	-		•	r	'age	<del></del>	. OI _	
7440 S.W. Hunziker Street, Suite ( Tigard, OR 97223	С	Р	roject Nam	e: <u>(</u>	hister	n div	· <u>\$</u>	W						Projec	ct No	. 11	-00	27	90	4)	
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#### **ENVIRONMENTAL CHEMISTS**

James E. Bruya, Ph.D. Yelena Aravkina, M.S. Bradley T. Benson, B.S. Kurt Johnson, B.S.

3012 16th Avenue West Seattle, WA 98119-2029 TEL: (206) 285-8282 e-mail: fbi@isomedia.com

October 3, 2012

Chris Wohlers, Project Manager Wohlers Environmental Services, Inc. 7440 S.W. Hunziker St., Suite C Tigard, OR 97223

Dear Mr. Wohlers:

Included are the results from the testing of material submitted on September 21, 2012 from the Christenson OWS SCE Sampling 11-0079(3), F&BI 209329 project. There are 17 pages included in this report. Any samples that may remain are currently scheduled for disposal in 30 days. If you would like us to return your samples or arrange for long term storage at our offices, please contact us as soon as possible.

We appreciate this opportunity to be of service to you and hope you will call if you should have any questions.

Sincerely,

FRIEDMAN & BRUYA, INC.

Michael Erdahl Project Manager

**Enclosures** 

c: Kelly Branson, Evelyn Cummings

WOH1003R.DOC

#### ENVIRONMENTAL CHEMISTS

#### CASE NARRATIVE

This case narrative encompasses samples received on September 21, 2012 by Friedman & Bruya, Inc. from the Wohlers Environmental Services Christenson OWS SCE Sampling 11-0079(3), F&BI 209329 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID Wohlers Environmental Services

209329-01 SED-OWS-1-92012

Sample SED-OWS-1-92012 was sent to Fremont for total organic carbon and grain size analyses. The report is enclosed.

All quality control requirements were acceptable.

#### ENVIRONMENTAL CHEMISTS

Date of Report: 10/03/12 Date Received: 09/21/12

Project: Christenson OWS SCE Sampling 11-0079(3), F&BI 209329

Date Extracted: 09/24/12 Date Analyzed: 09/25/12

#### RESULTS FROM THE ANALYSIS OF SOIL SAMPLES FOR TOTAL PETROLEUM HYDROCARBONS AS GASOLINE USING METHOD NWTPH-Gx

Results Reported on a Dry Weight Basis Results Reported as mg/kg (ppm)

Sample ID Laboratory ID	Gasoline Range	Surrogate (% Recovery) (Limit 58-139)
SED-OWS-1-92012 209239-01	6.8	84
Method Blank 02-1757 MB	<2	90

#### **ENVIRONMENTAL CHEMISTS**

Date of Report: 10/03/12 Date Received: 09/21/12

Project: Christenson OWS SCE Sampling 11-0079(3), F&BI 209329

Date Extracted: 09/25/12 Date Analyzed: 09/26/12

# RESULTS FROM THE ANALYSIS OF SOIL SAMPLES FOR TOTAL PETROLEUM HYDROCARBONS AS DIESEL AND MOTOR OIL USING METHOD NWTPH-Dx Sample Extracts Passed Through a Silica Gel Column Prior to Analysis

Results Reported on a Dry Weight Basis Results Reported as mg/kg (ppm)

Sample ID Laboratory ID	$\frac{\text{Diesel Range}}{(C_{10}\text{-}C_{25})}$	Motor Oil Range (C <sub>25</sub> -C <sub>36</sub> )	Surrogate (% Recovery) (Limit 53-144)
SED-OWS-1-92012 209329-01	1,700 x	9,000	96
Method Blank	< 50	<250	105

#### **ENVIRONMENTAL CHEMISTS**

#### Analysis For Total Metals By EPA Method 200.8

Client ID:	SED-OWS-1-92012	Client:	Wohlers Environmental Services
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Date Received: 09/21/12 Project: Christenson OWS SCE Sampling 11-0079(3)

 Date Extracted:
 09/24/12
 Lab ID:
 209329-01

 Date Analyzed:
 09/24/12
 Data File:
 209329-01.099

 Matrix:
 Soil
 Instrument:
 ICPMS1

Units: mg/kg (ppm) Operator: AP

		Lower	Upper
Internal Standard:	% Recovery:	Limit:	Limit:
Germanium	73	60	125
Indium	63	60	125
Holmium	70	60	125

	Concentration
Analyte:	mg/kg (ppm)

Chromium 31.0 Nickel 17.7 Copper 71.2 Zinc 752 Arsenic 3.89 Selenium <1 Silver <1 Cadmium 4.12 Barium 109 Lead 116 Manganese 189

#### **ENVIRONMENTAL CHEMISTS**

#### Analysis For Total Metals By EPA Method 200.8

Client ID: Method Blank Client: Wohlers Environmental Services

Date Received: NA Project: Christenson OWS SCE Sampling 11-0079(3)

Lab ID: Date Extracted: 09/24/12 I2-646 mb Data File: I2-646 mb.081 Date Analyzed: 09/24/12 Matrix: Soil Instrument: ICPMS1 Units: mg/kg (ppm) Operator: AP

Lower Upper **Internal Standard:** Limit: % Recovery: Limit: Germanium 60 125 75 74 60 Indium 125 Holmium 82 60 125

Concentration
Analyte: mg/kg (ppm)

Chromium <1 Nickel <1 Copper <1 Zinc <1 Arsenic <1 Selenium <1 Silver <1 Cadmium <1 Barium <1 Lead <1 Manganese <1

#### ENVIRONMENTAL CHEMISTS

Date of Report: 10/03/12 Date Received: 09/21/12

Project: Christenson OWS SCE Sampling 11-0079(3), F&BI 209329

Date Extracted: 09/24/12 Date Analyzed: 09/26/12

#### RESULTS FROM THE ANALYSIS OF THE SOIL SAMPLES FOR TOTAL MERCURY USING EPA METHOD 1631E

Results Reported on a Dry Weight Basis Results Reported as mg/kg (ppm)

Sample ID	<u>Total Mercury</u>
Laboratory ID	•
SED-OWS-1-92012	<0.1
209329-01	
Method Blank	< 0.1

#### **ENVIRONMENTAL CHEMISTS**

#### Analysis For Semivolatile Compounds By EPA Method 8270D SIM

Client Sample ID:	SED-OWS-1-92012	Client:	Wohlers Environmental Services
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Date Received: 09/21/12 Project: Christenson OWS SCE Sampling 11-0079(3)

Date Extracted: Lab ID: 09/26/12 209329-01 1/50 Date Analyzed: 10/01/12 Data File: 100110.D Matrix: Soil Instrument: GCMS6 Units: mg/kg (ppm) Operator: VM

		Lower	Upper
Surrogates:	% Recovery:	Limit:	Limit:
Anthracene-d10	30 ds	50	150
Benzo(a)anthracene-d12	112 ds	35	159

Compounds:	Concentration mg/kg (ppm)
Naphthalene	< 0.2
Acenaphthylene	< 0.2
Acenaphthene	< 0.2
Fluorene	< 0.2
Phenanthrene	0.75
Anthracene	< 0.2
Fluoranthene	1.1
Pyrene	1.1
Benz(a)anthracene	0.37
Chrysene	0.59
Benzo(a)pyrene	0.43
Benzo(b)fluoranthene	0.63
Benzo(k)fluoranthene	0.22
Indeno(1,2,3-cd)pyrene	0.42
Dibenz(a,h)anthracene	< 0.2
Benzo(g,h,i)perylene	0.43

#### **ENVIRONMENTAL CHEMISTS**

#### Analysis For Semivolatile Compounds By EPA Method 8270D SIM

Client Sample ID: Method Blank Client: Wohlers Environmental Services

Date Received: NA Project: Christenson OWS SCE Sampling 11-0079(3)

Date Extracted: 09/26/12 Lab ID: 02-1774 mb fl 1/5

Date Analyzed: 09/27/12 Data File: 092707.D Matrix: Soil Instrument: GCMS6 Units: mg/kg (ppm) Operator: VM

Lower Upper Surrogates: % Recovery: Limit: Limit: Anthracene-d10 92 50 150 Benzo(a)anthracene-d12 99 35 159

Concentration
Compounds: mg/kg (ppm)

Naphthalene <0.01

Acenaphthylene <0.01

Acenaphthylene < 0.01 Acenaphthene < 0.01 Fluorene < 0.01 Phenanthrene < 0.01 Anthracene < 0.01 Fluoranthene < 0.01 Pyrene < 0.01 Benz(a)anthracene < 0.01 Chrysene < 0.01 Benzo(a)pyrene < 0.01 Benzo(b)fluoranthene < 0.01 Benzo(k)fluoranthene < 0.01 Indeno(1,2,3-cd)pyrene < 0.01 Dibenz(a,h)anthracene < 0.01 Benzo(g,h,i)perylene < 0.01

#### **ENVIRONMENTAL CHEMISTS**

#### Analysis For PCBs By EPA Method 8082

Client Sample ID: SED-OWS-1-92012 Client: Wohlers Environmental Services

Date Received: 09/21/12 Project: Christenson OWS SCE Sampling 11-0079(3)

Date Extracted: 09/24/12 Lab ID: 209329-01

Date Analyzed: 09/25/12 Data File: 092518.D\ECD1A.CH

Concentration
Compounds: mg/kg (ppm)

Aroclor 1221 <0.1
Aroclor 1232 <0.1
Aroclor 1016 <0.1

Aroclor 1242 <0.1 Aroclor 1248 <0.1 Aroclor 1254 <0.1 Aroclor 1260 <0.1

#### **ENVIRONMENTAL CHEMISTS**

#### Analysis For PCBs By EPA Method 8082

Client Sample ID: Method Blank Client: Wohlers Environmental Services

Date Received: NA Project: Christenson OWS SCE Sampling 11-0079(3)

Date Extracted: 09/24/12 Lab ID: 02-1759 mb

Date Analyzed: 09/25/12 Data File: 092510.D\ECD1A.CH

Concentration mg/kg (ppm)

Aroclor 1221 <0.1

Aroclor 1232 <0.1

Aroclor 1232 <0.1
Aroclor 1016 <0.1
Aroclor 1242 <0.1
Aroclor 1248 <0.1
Aroclor 1254 <0.1
Aroclor 1260 <0.1

#### **ENVIRONMENTAL CHEMISTS**

Date of Report: 10/03/12 Date Received: 09/21/12

Project: Christenson OWS SCE Sampling 11-0079(3), F&BI 209329

#### QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF SOIL SAMPLES FOR TPH AS GASOLINE USING METHOD NWTPH-Gx

Laboratory Code: 209335-01 (Duplicate)

, , ,			(Wet Wt)	Relative Percent
	7)	Vet Wt)	Duplicate	Difference
Analyte	Reporting Units Sam	ple Result	Result	(Limit 20)
Gasoline	mg/kg (ppm)	<2	<2	nm

			Percent		
		Spike	Recovery	Acceptance	
Analyte	Reporting Units	Level	LCS	Criteria	
Gasoline	mg/kg (ppm)	20	95	61-153	

#### ENVIRONMENTAL CHEMISTS

Date of Report: 10/03/12 Date Received: 09/21/12

Project: Christenson OWS SCE Sampling 11-0079(3), F&BI 209329

# QUALITY ASSURANCE RESULTS FROM THE ANALYSIS OF SOIL SAMPLES FOR TOTAL PETROLEUM HYDROCARBONS AS DIESEL EXTENDED USING METHOD NWTPH-Dx

Laboratory Code: 209373-02 (Matrix Spike) Silica Gel

-		_	(Wet wt)	Percent	Percent		
	Reporting	Spike	Sample	Recovery	Recovery MSD	Acceptance	RPD
Analyte	Units	Level	Result	MS		Criteria	(Limit 20)
Diesel Extended	mg/kg (ppm)	5.000	770	100	117	64-133	16

Laboratory Code: Laboratory Control Sample Silica Gel

Percent

	Reporting	Spike	Recovery	Acceptance
Analyte	Units	Level	LCS	Criteria
Diesel Extended	mg/kg (ppm)	5,000	101	58-147

#### ENVIRONMENTAL CHEMISTS

Date of Report: 10/03/12 Date Received: 09/21/12

Project: Christenson OWS SCE Sampling 11-0079(3), F&BI 209329

#### QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF SOIL SAMPLES FOR TOTAL METALS USING EPA METHOD 200.8

Laboratory Code: 209236-14 (Matrix Spike)

				Percent	Percent		
	Reporting	Spike	Sample	Recovery	Recovery	Acceptance	RPD
Analyte	Units	Level	Result	MS	MSD	Criteria	(Limit 20)
Chromium	mg/kg (ppm)	50	4.99	87	83	63-120	5
Nickel	mg/kg (ppm)	25	10.2	88 b	88 b	54-125	0 b
Copper	mg/kg (ppm)	50	5.48	89	85	46-133	5
Zinc	mg/kg (ppm)	50	6.09	92	91	49-129	1
Arsenic	mg/kg (ppm)	10	1.36	105	103	56-125	2
Selenium	mg/kg (ppm)	5	<1	99	98	64-118	1
Silver	mg/kg (ppm)	10	<1	104	102	83-112	2
Cadmium	mg/kg (ppm)	10	<1	104	102	85-117	2
Barium	mg/kg (ppm)	50	21.1	113 b	111 b	65-132	2 b
Lead	mg/kg (ppm)	50	1.08	106	106	64-139	0
Manganese	mg/kg (ppm	20	34.6	81 b	84 b	21-174	4 b

		Percent			
		Spike	Recovery	Acceptance	
Analyte	Reporting Units	Level	LCS	Criteria	
Chromium	mg/kg (ppm)	50	92	81-117	
Nickel	mg/kg (ppm)	25	95	86-118	
Copper	mg/kg (ppm)	50	96	86-116	
Zinc	mg/kg (ppm)	50	95	84-121	
Arsenic	mg/kg (ppm)	10	102	79-112	
Selenium	mg/kg (ppm)	5	99	83-113	
Silver	mg/kg (ppm)	10	103	85-113	
Cadmium	mg/kg (ppm)	10	101	88-114	
Barium	mg/kg (ppm)	50	107	87-113	
Lead	mg/kg (ppm)	50	104	83-118	
Manganese	mg/kg (ppm)	20	88	86-118	

#### ENVIRONMENTAL CHEMISTS

Date of Report: 10/03/12 Date Received: 09/21/12

Project: Christenson OWS SCE Sampling 11-0079(3), F&BI 209329

#### QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF SOIL SAMPLES FOR TOTAL MERCURY USING EPA METHOD 1631E

Laboratory Code: 209236-14 (Matrix Spike)

				Percent	Percent		
	Reporting	Spike	Sample	Recovery	Recovery	Acceptance	RPD
Analyte	Units	Level	Result	MS	MSD	Criteria	(Limit 20)
Mercury	mg/kg (ppm)	0.125	< 0.1	102	100	54-156	2

			Percent	
	Reporting Units	Spike	Recovery	Acceptance
Analyte		Level	LCS	Criteria
Mercury	mg/kg (ppm)	0.125	95	73-131

#### ENVIRONMENTAL CHEMISTS

Date of Report: 10/03/12 Date Received: 09/21/12

Project: Christenson OWS SCE Sampling 11-0079(3), F&BI 209329

## QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF SOIL SAMPLES FOR PNA'S BY EPA METHOD 8270D SIM

Laboratory Code: 209247-08 (Matrix Spike)

	oo (ividei iii opiiio)			Percent	
	Reporting	Spike	Sample	Recovery	Acceptance
Analyte	Units	Level	Result	MS	Criteria
Naphthalene	mg/kg (ppm)	0.17	0.019	97	44-129
Acenaphthylene	mg/kg (ppm)	0.17	< 0.01	95	52-121
Acenaphthene	mg/kg (ppm)	0.17	< 0.01	90	51-123
Fluorene	mg/kg (ppm)	0.17	< 0.01	94	37-137
Phenanthrene	mg/kg (ppm)	0.17	< 0.01	96	45-124
Anthracene	mg/kg (ppm)	0.17	< 0.01	94	32-124
Fluoranthene	mg/kg (ppm)	0.17	< 0.01	99	50-125
Pyrene	mg/kg (ppm)	0.17	< 0.01	102	41-135
Benz(a)anthracene	mg/kg (ppm)	0.17	< 0.01	95	23-144
Chrysene	mg/kg (ppm)	0.17	< 0.01	98	45-122
Benzo(b)fluoranthene	mg/kg (ppm)	0.17	< 0.01	105	31-144
Benzo(k)fluoranthene	mg/kg (ppm)	0.17	< 0.01	102	45-130
Benzo(a)pyrene	mg/kg (ppm)	0.17	< 0.01	98	39-128
Indeno(1,2,3-cd)pyrene	mg/kg (ppm)	0.17	< 0.01	126	28-146
Dibenz(a,h)anthracene	mg/kg (ppm)	0.17	< 0.01	118	46-129
Benzo(g,h,i)perylene	mg/kg (ppm)	0.17	< 0.01	108	37-133

			Percent	Percent		
	Reporting	Spike	Recovery	Recovery	Acceptance	RPD
Analyte	Units	Level	LCS	LCSD	Criteria	(Limit 20)
Naphthalene	mg/kg (ppm)	0.17	90	94	58-121	4
Acenaphthylene	mg/kg (ppm)	0.17	91	95	54-121	4
Acenaphthene	mg/kg (ppm)	0.17	87	91	54-123	4
Fluorene	mg/kg (ppm)	0.17	90	95	56-127	5
Phenanthrene	mg/kg (ppm)	0.17	89	93	55-122	4
Anthracene	mg/kg (ppm)	0.17	88	91	50-120	3
Fluoranthene	mg/kg (ppm)	0.17	94	96	54-129	2
Pyrene	mg/kg (ppm)	0.17	84	89	53-127	6
Benz(a)anthracene	mg/kg (ppm)	0.17	83	88	51-115	6
Chrysene	mg/kg (ppm)	0.17	87	92	55-129	6
Benzo(b)fluoranthene	mg/kg (ppm)	0.17	98	100	56-123	2
Benzo(k)fluoranthene	mg/kg (ppm)	0.17	90	97	54-131	7
Benzo(a)pyrene	mg/kg (ppm)	0.17	86	91	51-118	6
Indeno(1,2,3-cd)pyrene	mg/kg (ppm)	0.17	95	106	49-148	11
Dibenz(a,h)anthracene	mg/kg (ppm)	0.17	93	99	50-141	6
Benzo(g,h,i)perylene	mg/kg (ppm)	0.17	83	88	52-131	6

#### **ENVIRONMENTAL CHEMISTS**

Date of Report: 10/03/12 Date Received: 09/21/12

Project: Christenson OWS SCE Sampling 11-0079(3), F&BI 209329

#### QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF SOIL SAMPLES FOR POLYCHLORINATED BIPHENYLS AS AROCLOR 1016/1260 BY EPA METHOD 8082A

Laboratory Code: 209334-02 (Duplicate)

	Reporting	Sample	Duplicate	RPD
Analyte	Units	Result	Result	(Limit 20)
Aroclor 1016	mg/kg (ppm)	< 0.1	< 0.1	nm
Aroclor 1260	mg/kg (ppm)	< 0.1	< 0.1	nm

	Reporting	Spike	% Recovery	% Recovery	Acceptance	RPD
Analyte	Units	Level	LCS	LCSD	Criteria	(Limit 20)
Aroclor 1016	mg/kg (ppm)	0.8	98	96	70-130	2
Aroclor 1260	mg/kg (ppm)	0.8	95	92	70-130	3

#### **ENVIRONMENTAL CHEMISTS**

#### **Data Qualifiers & Definitions**

- $\boldsymbol{a}$  The analyte was detected at a level less than five times the reporting limit. The RPD results may not provide reliable information on the variability of the analysis.
- A1 More than one compound of similar molecule structure was identified with equal probability.
- b The analyte was spiked at a level that was less than five times that present in the sample. Matrix spike recoveries may not be meaningful.
- $\mbox{\it ca}$  The calibration results for this range fell outside of acceptance criteria. The value reported is an estimate.
- c The presence of the analyte indicated may be due to carryover from previous sample injections.
- d The sample was diluted. Detection limits may be raised due to dilution.
- ds The sample was diluted. Detection limits are raised due to dilution and surrogate recoveries may not be meaningful.
- dv Insufficient sample was available to achieve normal reporting limits and limits are raised accordingly.
- fb Analyte present in the blank and the sample.
- fc The compound is a common laboratory and field contaminant.
- hr The sample and duplicate were reextracted and reanalyzed. RPD results were still outside of control limits. The variability is attributed to sample inhomogeneity.
- ht Analysis performed outside the method or client-specified holding time requirement.
- ip Recovery fell outside of normal control limits. Compounds in the sample matrix interfered with the quantitation of the analyte.
- j The result is below normal reporting limits. The value reported is an estimate.
- J The internal standard associated with the analyte is out of control limits. The reported concentration is an estimate.
- jl The analyte result in the laboratory control sample is out of control limits. The reported concentration should be considered an estimate.
- jr The rpd result in laboratory control sample associated with the analyte is out of control limits. The reported concentration should be considered an estimate.
- js The surrogate associated with the analyte is out of control limits. The reported concentration should be considered an estimate.
- lc The presence of the compound indicated is likely due to laboratory contamination.
- L The reported concentration was generated from a library search.
- nm The analyte was not detected in one or more of the duplicate analyses. Therefore, calculation of the RPD is not applicable.
- pc The sample was received in a container not approved by the method. The value reported should be considered an estimate.
- $\operatorname{pr}$  The sample was received with incorrect preservation. The value reported should be considered an estimate.
- ve Estimated concentration calculated for an analyte response above the valid instrument calibration range. A dilution is required to obtain an accurate quantification of the analyte.
- vo The value reported fell outside the control limits established for this analyte.
- x The sample chromatographic pattern does not resemble the fuel standard used for quantitation.



1311 N. 35th St. Seattle, WA 98103 T: (206) 352-3790 F: (206) 352-7178 info@fremontanalytical.com

Friedman & Bruya

Michael Erdahl 3012 16th Ave. W. Seattle, Washington 98119

RE: 209329

Lab ID: 1209138

October 02, 2012

#### **Attention Michael Erdahl:**

Fremont Analytical, Inc. received 1 sample(s) on 9/24/2012 for the analyses presented in the following report.

Grain Size by ASTM D422 Sample Moisture (Percent Moisture) Total Organic Carbon by EPA Method 9060

This report consists of the following:

- Case Narrative
- Analytical Results
- Applicable Quality Control Summary Reports
- Chain of Custody

All analyses were performed consistent with the Quality Assurance program of Fremont Analytical, Inc. Please contact the laboratory if you should have any questions about the results.

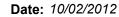
Thank you for using Fremont Analytical.

Sincerely,

Michael Dee

MGR

Sr. Chemist / Principal





CLIENT: Friedman & Bruya Work Order Sample Summary

**Project**: 209329 **Lab Order**: 1209138

Lab Sample ID Client Sample ID Date/Time Collected Date/Time Received

1209138-001 SED-OWS-1-92012 09/20/2012 7:35 AM 09/24/2012 4:00 PM

Note: If no "Time Collected" is supplied, a default of 12:00AM is assigned



#### **Case Narrative**

WO#: **1209138**Date: **10/2/2012** 

CLIENT: Friedman & Bruya

**Project:** 209329

#### I. SAMPLE RECEIPT:

All samples were received intact.

#### II. GENERAL REPORTING COMMENTS:

Results are reported on a wet weight basis unless dry-weight correction is denoted in the units field on the analytical report ("mg/kg-dry" or "ug/kg-dry").

Matrix Spike (MS) and MS Duplicate (MSD) samples are tested from an analytical batch of "like" matrix to check for possible matrix effect. The MS and MSD will provide site specific matrix data only for those samples which are spiked by the laboratory. The sample chosen for spike purposes may or may not have been a sample submitted in this sample delivery group. The validity of the analytical procedures for which data is reported in this analytical report is determined by the Laboratory Control Sample (LCS) and the Method Blank (MB). The LCS and the MB are processed with the samples and the MS/MSD to ensure method criteria are achieved throughout the entire analytical process.

#### III. ANALYSES AND EXCEPTIONS:

Exceptions associated with this report will be footnoted in the analytical results page(s) or the quality control summary page(s) and/or noted below.



#### **Analytical Report**

WO#: **1209138** 

Date Reported: 10/2/2012

Client: Friedman & Bruya Collection Date: 9/20/2012 7:35:00 AM

**Project**: 209329

**Lab ID:** 1209138-001 **Matrix:** Soil

Client Sample ID: SED-OWS-1-92012

**Analyses** Result RL Qual Units DF **Date Analyzed Sample Moisture (Percent Moisture)** Batch ID: R5854 Analyst: CM Percent Moisture 60.7 wt% 9/25/2012 11:46:56 AM Batch ID: 3280 Analyst: MC Total Organic Carbon by EPA Method 9060 **Total Organic Carbon** 0.200 9/26/2012 3:28:30 PM 13.8 %-dry

Qualifiers: B Analyte detected in the associated Method Blank

E Value above quantitation range

J Analyte detected below quantitation limits

RL Reporting Limit

D Dilution was required

H Holding times for preparation or analysis exceeded

ND Not detected at the Reporting Limit

S Spike recovery outside accepted recovery limits



1311 N. 35th Street Seattle, WA 98103 Tel: 206-352-3790

Fax: 206-352-/1/8

Email: info@fremontanalytical.com

#### Grain Size by ASTM D422

Project: 2090329

Client: Friedman & Bruya Lab Project #: 1209138

#### Percent Finer (Passing) Than the Indicated Size

#### UOM = Percent (%)

Sieve Size	3/4"	1/2"	3/8"	#4	#10	#20	#40	#60	#100	#200	#325	#450
Particle Size (Microns)	19000	12500	9500	4750	2000	850	425	250	150	75	45	34
ED-OWS-1-92012	100	100	100	100	99.9	92.3	86.7	79.4	69.8	28.6	4.49	0.589



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Fax: 206-352-7178

Email: info@fremontanalytical.com

#### Grain Size by ASTM D422

Project: 2090329

Client: Friedman & Bruya Lab Project #: 1209138

#### Percent Retained in Each Size Fraction

UOM = Percent (%)

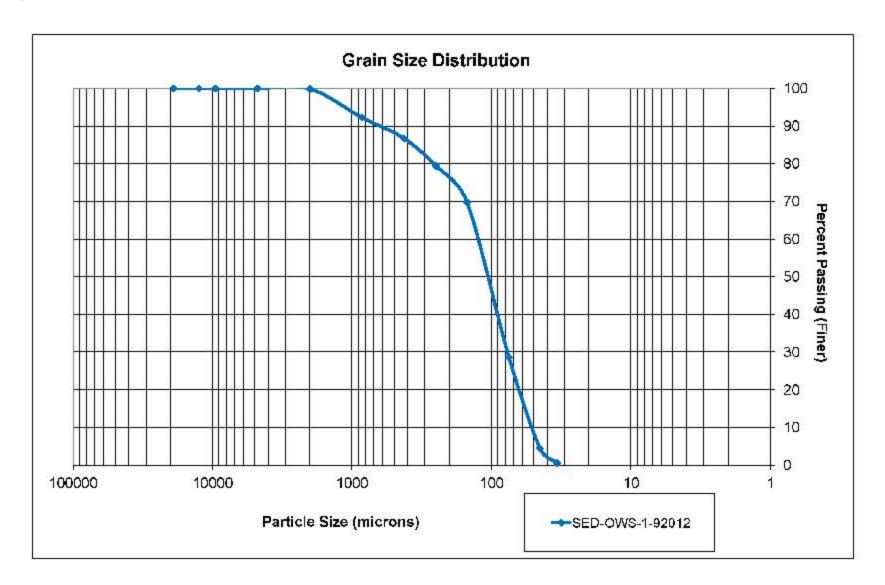
Sieve Size (Microns)	>19000	19000-12500	12500-9500	9500-4750	4750-2000	2000-850	850-425	425-250	250-150	150-75	75-45	45-34	<34
SED-OWS-1-92012	0.00	0.00	0.00	0.00	0.123	3.29	5.81	7.67	14.7	43.1	25.2	4.08	0.616

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Lmail: info@fremontana ytical.com

#### **Grain Size by ASTM D422**

Project: 2090329 Client: Friedman & Bruya Lab Project #: 1208138



accepted recovery limits



**Date:** 10/2/2012

Total Organic Carbon by EPA Method 9060 **QC SUMMARY REPORT** Qual %RPD RPDLimit SeqNo: 115974 RunNo: 5875 %REC LowLimit HighLimit RPD Ref Val Analysis Date: 9/25/2012 Prep Date: 9/21/2012 Units: %-dry SPK value SPK Ref Val 씸 0.200 SampType: MBLK Batch ID: 3280 Result  $\frac{1}{2}$ Friedman & Bruya 1209138 209329 Sample ID: MB-3280 Total Organic Carbon Client ID: MBLKS Work Order: CLIENT: Project: Analyte

Sample ID: LCS-3280	SampType: LCS			Units: %-dry		Prep Date: 9/21/2012	RunNo: 5875
Client ID: LCSS	Batch ID: 3280					Analysis Date: 9/25/2012	SeqNo: 115982
Analyte	Result	씸	SPK value	SPK value SPK Ref Val	%REC	%REC LowLimit HighLimit RPD Ref Val	%RPD RPDLimit Qual
Total Organic Carbon	39.3	0.200	40.00	0	98.2	85 115	
Sample ID: 1208203-017AMS	SampType: MS			Units: %-dry		Prep Date: <b>9/21/2012</b>	RunNo: <b>5875</b>
Client ID: BATCH	Batch ID: 3280					Analysis Date: 9/26/2012	SeqNo: 116019
Analyte	Result	귐	SPK value	SPK value SPK Ref Val	%REC	LowLimit HighLimit RPD Ref Val	%RPD RPDLimit Qual

Sample ID: 1209138-001ADUP	138-001ADUP	SampType: <b>DUP</b>	JP.		Units: %-dry		Prep Date	Prep Date: <b>9/21/2012</b>	RunNo: <b>5875</b>		
Client ID: SED-OWS-1-92012	-OWS-1-92012	Batch ID: 3280	083			•	Analysis Date:	9/26/2012	SeqNo: 117753		
Analyte		Result	ılt RL	SPK value	SPK Ref Val	%REC	LowLimit HighLimit	HighLimit RPD Ref Val	%RPD RPI	%RPD RPDLimit Qual	<u>a</u>
Total Organic Carbon	rbon	13.6	.6 0.200					13.80	1.46	30	

120

80

85.7

1.580

2.400

0.200

3.64

Total Organic Carbon

Qualifiers:	В	Analyte detected in the associated Method Blank	D	Dilution was required	Ш	Value above quantitation range
	I	Holding times for preparation or analysis exceeded	7	Analyte detected below quantitation limits	9	Not detected at the Reporting Limit
	ď	RPD outside accepted recovery limits	귙	Reporting Limit	S	Spike recovery outside accepted recov

## SUBCONTRACT SAMPLE CHAIN OF CUSTODY |209 138

City, State, ZIP_Se Phone #(206) 285			6) 283-5044		REMARKS Pl	ease Er	nail R	esults					☐ Dispo	se after n sampl	E DISPOSAL : 30 days les a instructions
Sample ID	Lab ID	- Date Sampled	Time Sampled	Mat	rix # of jars	Dioxins and Furans by 8290	ЕРН	VPH	Nitrate	Sulfate	Alkalinity	Tot. Org. Carle.	Grain Size		Notes
SED-0WS-1-92012		9/20/12	0735°	Soi	1 43							۶	*		
															1.
										-					

Friedman & Bruya, Inc. 3012 16th Avenue West

Send Report To Michael Erdahl

Friedman and Bruya, Inc.

3012 16th Ave W

Company\_

Address

Seattle, WA 98119-2029

Ph. (206) 285-8282

Fax (206) 283-5044

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished	Michael Erdahl	Friedman & Bruya	9/24/12	Noon .
Received by: Quantum State of the Receiv	Clare Gingas	FAI	9.24.12	4 pm
Relinquished by:	- W			
Received by:				



Wohlers Environmental

Metals As, Ba, Cd, Cr, Cu, Pb, Mn, Hg N., Se, Ag, In ME 09-21-12

#### CHAIN OF CUSTODY RECORD

Date: 9/20/12 Page / of /

7440 S.W. Hunziker Street, Suite C Project Name: Christinsa OUS SCE Sampling Tigard, OR 97223 Phone: (503) 670-1344

Company: FeBI

Laboratory:

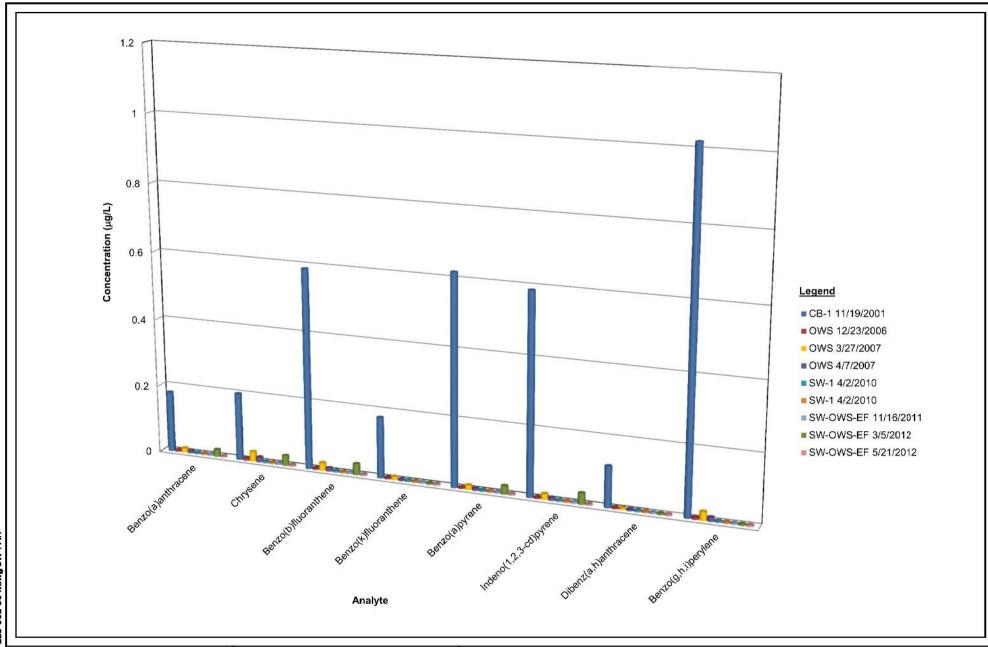
Project Manager: Chris Wohles Fax: (503) 670-1701 Joh Nosta – estates – estates estategares esta TURNAROUND: RUSH: 24-Hour \_\_\_\_\_ 3-5 Day: BTEX - EPA 8020m Full Panel VOC – EPA 8260/8240 PAHS - EPA 8270 3CBS 8081A 7-10 Day: \_\_\_\_\_ 48-Hour \_\_\_\_\_ Dissolved Lead Grain Site. Special Instructions: Tox by Plumb 1981 Grain Gree by PSEP 1986 TCLP - Lead NWTPH-Gx HOLD Lab ID Sample ID **Date** Time Matrix 9/20/12 0735 501/ 01A-L 1. SED-OWS-1-92012 5. 9. 10. 11. 12. 13. Samples received at 14. 15. elinquished By: Relinquished By: Received By Laboratory: Date: Received By: Date: 9/20/12 Signym / W/ ams Sign: Sign: Time: Print: Print: 0900

Company:

# APPENDIX F SAMPLING DATA CHARTS

SOURCE CONTROL EVALUATION REPORT CHRISTENSON OIL COMPANY PORTLAND, OREGON

> PACIFIC CREST NO. 123-001 ECSI NO. 2426

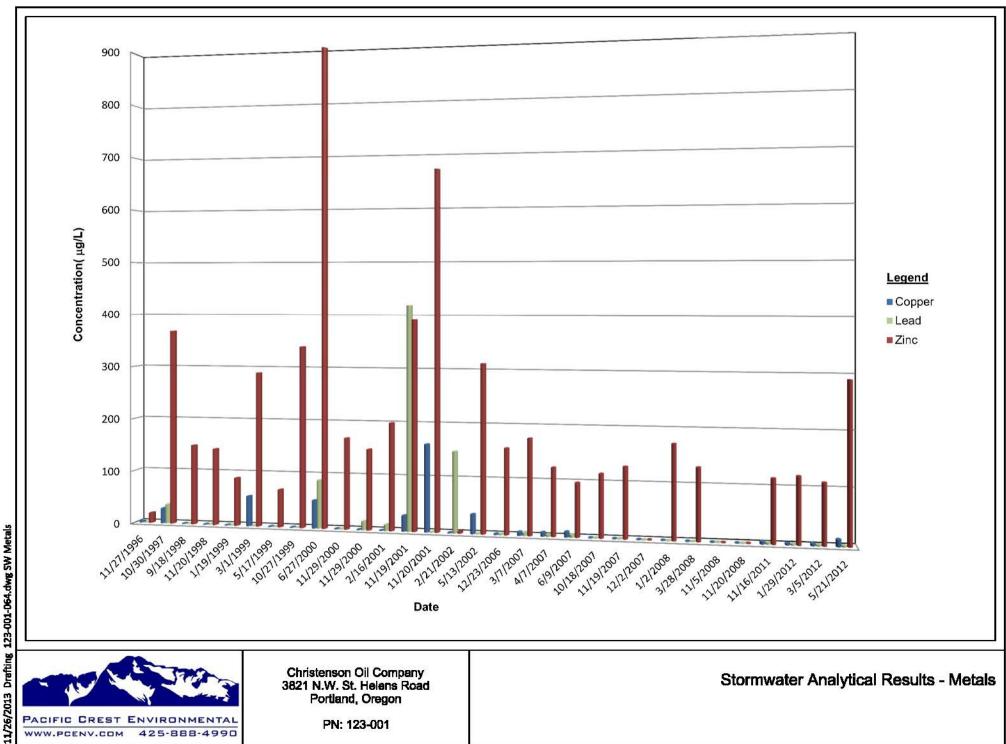




Christenson Oil Company 3821 N.W. St. Helens Road Portland, Oregon

PN: 123-001

Stormwater Analytical Results - PAHs





Christenson Oil Company 3821 N.W. St. Helens Road Portland, Oregon

PN: 123-001